

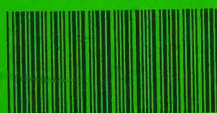
GHY PLANT 1863,
1865 & 1867

S.H.F. Group (Ae. 5 Site)

**6700A Series
Plug-in RF Units for
Sweep Oscillator 6700B**

INSTRUCTION MANUAL

MP MASTER



MA23598

mi

MARCONI INSTRUMENTS

6700A Series Plug-in RF Units for Sweep Oscillator 6700B

Note...

In most respects this manual is equally applicable to r.f. units operated in the 6700B mainframe, but RF Unit type 6790A is compatible only with 6700B.

This copy supplied with

RF Unit type

Serial No.

©

1978

**MARCONI INSTRUMENTS LIMITED
MICROWAVE PRODUCTS DIVISION**

(formerly Sanders Division)

STEVENAGE HERTFORDSHIRE ENGLAND

A GEC-MARCONI ELECTRONICS COMPANY

CONTENTS

PRELIMINARIES

Title page
Contents
Preface
Notes and cautions

CHAPTERS

1 General information
2 Installation
3 Operation
4 Technical description
5 Maintenance
6 Replaceable parts
7 Servicing diagrams

Note...

Each page bears the date of the original issue or the code number and date of the latest amendment (Am. 1, Am. 2 etc.). New or amended material of technical importance introduced by the latest amendment is indicated by triangles positioned thus ►.....◄ to show the extent of the change. When a chapter is reissued the triangles do not appear.

Any changes subsequent to the latest amendment state of the manual are included on inserted sheets coded C1, C2 etc.

As we are always seeking to improve our products, the information in this document gives only general indications of product capacity, performance and suitability, none of which shall form part of any contract.

PREFACE

Details of RF components specific to:-

RF Unit Type..... Serial No.....
Frequency range.....GHz

Solid State Oscillator:

Manufacturer
Type No.
Serial No.
Tuning system YIG/varactor
Bias voltage(s) (fixed).....V
(swept).....to.....V
Bias current, operational mA
Bias current, threshold mA
Tuning supply (low end) at.....GHz
Tuning supply (high end) at.....GHz

	Manufacturer	Type	Serial No.
PIN Diode Modulator			
Isolator			
Filter			
Directional Coupler			
Crystal Detector			
Frequency Converter (6790A only)			
Local Oscillator (6790A only)			
Amplifier (6790A only)			

Chapter 1

GENERAL INFORMATION

CONTENTS

Para.

- 1 Scope of manual
- 2 Description
- 4 Specifications

Fig.

- 1 Sweep Oscillator 6700B with RF Unit 6790A installed

Page

2

Table

- 1 Specifications of r.f. units
- 2 Specification of RF Unit type 6790A

SCOPE OF MANUAL

1. This manual contains information necessary for understanding the application and operation of the r.f. unit used with the type 6700B Sweep Oscillator. The manual provides a general description, installation information, operating instructions, principles of operation and maintenance information. A complete set of circuit diagrams is also provided to aid in understanding the various modes of operation and proper servicing of the equipment.

DESCRIPTION

2. The r.f. units are designed to be used in conjunction with the Marconi Instruments type 6700B Microwave Sweep Oscillator to provide a sweepable range of 10 MHz to 18.0 GHz. A typical r.f. unit installed in a 6700B Sweep Oscillator is shown in Fig.1. The plug-in r.f. unit is an integral part of the sweep oscillator circuitry and must be installed in the front panel compartment of the mainframe to operate. Available r.f. units covering nine frequency ranges are listed in Tables 1 and 2. All standard r.f. units are designed for external levelling. Optional r.f. units with internal levelling are also available, except for type 6790A in which internal levelling is a standard feature.

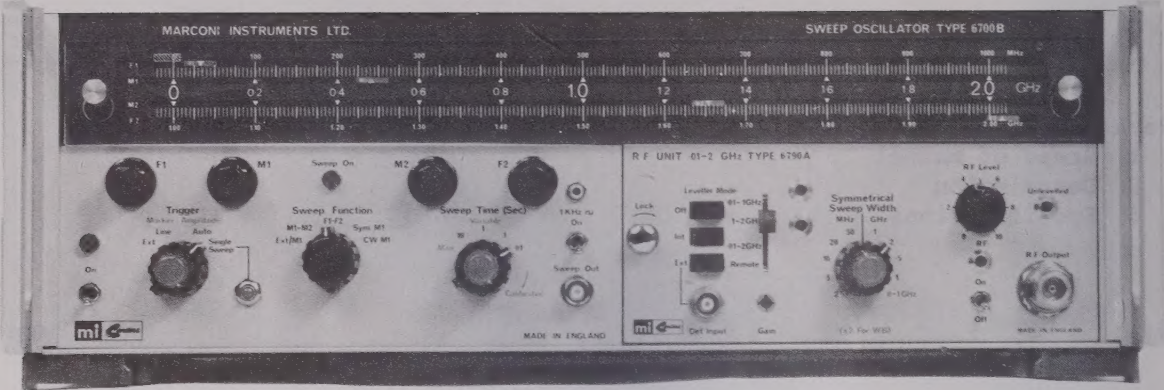


Fig. 1 Sweep Oscillator 6700B with RF Unit 6790A installed

3. Each r.f. unit is furnished with its own linear frequency scale which is simply attached to the front panel of the mainframe. Accurate positioning is ensured by key-hole slots at the ends of the scale which locate over retaining screws, obviating the necessity for complete removal of the screws when scales are interchanged.

SPECIFICATIONS

4. Table 1 shows the specifications for all r.f. units except type 6790A which is given in Table 2.

TABLE 1 SPECIFICATIONS OF RF UNITS

Specification with plug-in installed in 6700B	6730A	6738A	6742A	6754A	6760A	6766A	6770A	6774A
FREQUENCY RANGE (GHz)	1.0 - 2.0	1.7 - 4.3	2.0 - 4.0	4.0 - 8.0	7.0 - 11.0	8.0 - 12.4	10.0 - 15.0	12.4 - 18.0
FREQUENCY ACCURACY (at 25°C) after 10 min warm-up	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
FREQUENCY LINEARITY (% sweep width) for widths > 1%		0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
FREQUENCY STABILITY With temperature (1°C)	1 MHz	500 kHz	400 kHz	750 kHz	1.4 MHz	1.4 MHz	2 MHz	3 MHz
With 10% change of line voltage	10 kHz	20 kHz	20 kHz	30 kHz	40 kHz	40 kHz	50 kHz	60 kHz
With 10dB change of output power level	2 MHz	1 MHz	1 MHz	1 MHz	1 MHz	1 MHz	1.5 MHz	2 MHz
With 3:1 load VSWR (all phases)	±5 MHz	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%	±0.1%
POWER OUTPUT								
Minimum (at 25°C)	20 mW	10 mW	20 mW	10 mW	10 mW	10 mW	10 mW	6 mW
With internal levelling (Option-1) see Note 1								
Minimum (at 25°C)	25 mW	15 mW	25 mW	12 mW	12 mW	12 mW	12 mW	8 mW
Without internal levelling								
POWER VARIATION								
Internally levelled (Option-1) see Note 1	±0.6 dB	±0.5 dB	±0.5 dB	±0.5 dB	±0.7 dB	±0.7 dB	±1.0 dB	±1.0 dB
Externally levelled (excluding coupler and detector variation)	±0.1 dB	±0.1 dB	±0.1 dB	±0.1 dB	±0.1 dB	±0.1 dB	±0.1 dB	±0.1 dB
PEAK RESIDUAL FM	5 kHz	7 kHz	7 kHz	10 kHz	25 kHz	25 kHz	25 kHz	25 kHz
PEAK RESIDUAL AM	-50 dB	-50 dB	-50 dB	-50 dB	-50 dB	-50 dB	-50 dB	-50 dB
SPURIOUS SIGNALS (dB below fundamental at specified max power)								
Harmonics	-20 dB ⁴	-15 dB	-20 dB	-20 dB	-30 dB	-30 dB	-20 dB	-30 dB
Non-harmonics	-60 dB	-60 dB	-60 dB	-60 dB	-60 dB	-60 dB	-60 dB	-60 dB
MODULATION								
External f.m. input	d.c.	d.c.	d.c.	d.c.	d.c.	d.c.	d.c.	d.c.
bandwidth	-1 MHz	-100 kHz	-100 kHz	-100 kHz	-100 kHz	-100 kHz	-100 kHz	-100 kHz
Internal a.m. square wave on/off ratio	40 dB	40 dB	40 dB	40 dB	40 dB	40 dB	40 dB	40 dB
NETT WEIGHT	2.0 kg	2.2 kg	2.2 kg	2.2 kg	2.3 kg	2.3 kg	2.3 kg	2.6 kg

Notes ...

(1) Plug-ins with internal levelling (Option-1) include built-in directional coupler and detector.

(2) Levelling loop bandwidth is 150 kHz for all units.

(3) All 6700A series r.f. plug-in units in this table are compatible with the M1-Sanders Sweep Oscillator mainframe types 6700A, 6700B, 6700A/1 and 6700B/1.

(4) -17 dB between 1.0 and 1.1 GHz.

TABLE 2 SPECIFICATION OF RF UNIT TYPE 6790A
(operated in mainframe 6700B only)

FREQUENCY CHARACTERISTICS: Range: Three switchable bands: (can also be remotely selected) Accuracy (25°C) all modes: Linear (typical):	10 MHz to 1 GHz (heterodyne mode)	RESIDUAL AM IN 100 kHz BANDWIDTH: SPURIOUS SIGNALS (below fundamental):	50 dB below fundamental at maximum power
	1 to 2 GHz (fundamental mode)	Harmonics: Non-harmonics:	-20 dB at +13 dBm except 1.0-1.1 GHz (-17 dB) -30 dB: 0.01 to 0.85 GHz -25 dB: 0.85 to 1.0 GHz -50 dB: 1.0 to 2.0 GHz
STABILITY With temperature: With 10% line voltage change: With 10 db power level change: With 3:1 load v.s.w.r. (all phases): Residual f.m. (CW mode): With time (after 1 hour warm up):	5 MHz to 2.1 GHz	MODULATION CHARACTERISTICS: External a.m. Rise and fall time: Frequency response: RF on/off ratio: Modulation sensitivity: Internal a.m. 1 kHz square wave: on/off ratio	2 μ s 150 kHz 40 dB 5 dB/V 40 dB
	± 10 MHz ± 5 MHz ± 600 kHz/ $^{\circ}$ C ± 10 kHz ± 1 MHz $\pm 0.1\%$ 5 kHz peak typically ± 50 kHz/10 min.	RF blanking during retrace: External f.m. Maximum deviations for Modulation frequencies: DC to 100 Hz: 100 Hz to 1 kHz: 1 kHz to 5 MHz: Sensitivity (typical):	40 dB 40 dB full band ± 100 MHz ± 5 MHz 10 MHz/V
OUTPUT CHARACTERISTICS Minimum levelled power (25°C):	± 13 dBm (20 mW)		
POWER VARIATION Internally levelled: Externally levelled:	± 0.6 dB ± 0.1 dB (excluding coupler and detector variation)		

Chapter 2

INSTALLATION

CONTENTS

Para.

- 1 Unpacking
- 2 Installation of r.f. unit in 6700B mainframe
- 3 Operating temperature range
- 4 Repacking for shipment

UNPACKING

1. Plug-in r.f. units are shipped with the applicable frequency scales in specially designed cartons with shock-absorbing interior material. Use normal care when unpacking the instrument and removing the packing material. Do not destroy the carton or packing material until the equipment is thoroughly inspected. If damage is found, notify the carrier immediately and do not destroy any packing material until an agent of the carrier has examined it.

INSTALLATION OF RF UNIT IN 6700B MAINFRAME

2. If another r.f. unit is to be removed from the mainframe first, proceed as follows:

- (1) Turn off power.
- (2) Unfasten and remove the frequency scale from the mainframe by loosening the two knurled screws, and lifting the scale upwards and forwards over the screws.
- (3) Rotate the knurled LOCK knob on the r.f. unit front panel anti-clockwise. Draw the r.f. unit out of the mainframe by pulling on the LOCK thumbscrew and the RF OUTPUT connector.

Then, install the new r.f. unit as follows:

- (1) Place the new frequency scale (furnished with the r.f. unit) on the mainframe and fasten it by the two thumbscrews.
- (2) Rotate the knurled LOCK knob on the r.f. unit front panel anti-clockwise. Insert the r.f. unit into its compartment within the mainframe until its front panel is flush with the mainframe panel.
- (3) Rotate the knurled knob fully clockwise, but do not over-tighten.
- (4) Power may now be turned on. The equipment is ready for operation immediately.

OPERATING TEMPERATURE RANGE

3. The r.f. unit, together with the type 6700B mainframe, is designed to operate within its specifications when the ambient temperature is between 0°C and +50°C. Operating in ambient temperatures beyond these limits could affect the accuracy of the instrument and cause damage to its circuits.

REPACKING FOR SHIPMENT

4. To protect the unit during re-shipment, always use the best packing methods available. When possible, use the original packing containers and cushioning material. If installed in the mainframe during shipment, make certain the plug-in r.f. unit is securely locked in position and held there by cushioning material. If the original packing materials are not available, use the following procedure:

- (1) Wrap instrument in sturdy paper or plastic.
- (2) Place wrapped instrument in a strong shipping container; use a 20 mm layer of shock absorbing material around all sides of the unit to provide a firm cushion and prevent movement inside the container.
- (3) Thoroughly seal shipping container and mark it "FRAGILE".
- (4) If shipping for service, attach a tag to indicate:
 - a) Service required.
 - b) Description of malfunction.
 - c) Model and serial numbers.
 - d) Return address.
 - e) Authorization to conduct repairs.

Chapter 3

OPERATING INSTRUCTIONS

CONTENTS

Para.

- 1 Introduction
- 2 Front and rear panel familiarization
- 4 Operating considerations
- 5 Applying power
- 6 Sweep times
 - 6 Automatic
- 7 Sweep trigger selection
 - 7 Automatic
- 8 Line
- 9 External
- 10 Single sweep
- 11 Sweep function modes
 - 11 F1 - F2 mode
 - 13 M1 - M2 mode (expanded sweep)
 - 14 SYM - M1 mode (symmetrical sweep)
 - 20 CW M1 mode
 - 23 EXT/M1
- 25 Sweep response time control
- 26 RF level
- 27 RF power levelling
 - 27 General considerations
 - 29 Internal levelling
 - 30 External crystal levelling
 - 33 Power meter levelling
- 37 Frequency markers
- 39 Blanking during retrace
- 41 Amplitude modulation
 - 42 External a.m.
 - 43 External pulse
- 44 Displaying swept frequency measurements
- 48 Remote control of frequency and amplitude
 - 49 Frequency - analogue voltage control
 - 53 Frequency - resistance control
 - 54 Frequency - digital control
 - 56 RF amplitude - voltage and resistance control
- 57 Frequency modulation
 - 57 External f.m.
 - 58 Phase locking
 - 60 Remote band selection (6790A only)
 - 61 Computability with network analysers

Fig.		Page
1	Front panel controls and connectors	3
2	Rear panel controls and connectors	5
3	Swept frequency measurement using oscilloscope display ...	12
4	Swept frequency measurement using X-Y recorder display ...	13

INTRODUCTION

1. This section provides a detailed description of the type 6700B Sweep Oscillator's operating controls, indicators and connectors, and contains the procedures for operating the instrument. This section also describes the controls and indicators located on the r.f. unit. The type 6700B, a versatile r.f. signal source of both swept and static frequencies, provides four sweep modes: automatic, single, manual and external. The mainframe and nine basic r.f. units (see Tables 1 and 2) provide a continuous range of coverage from 10 MHz to 18.0 GHz.

FRONT AND REAR PANEL FAMILIARIZATION

2. Front panel. Fig. 1 illustrates and explains the function of all front panel fixtures for both the mainframe (encircled numbers) and an r.f. unit (encircled letters). Additional information regarding the proper use of the controls is provided in the operating procedures.

3. Rear panel. The identification and function of connectors and controls located on the rear panel for both the mainframe (encircled numbers) and an r.f. unit (encircled letters) are shown in Fig. 2.

OPERATING CONSIDERATIONS

4. Information regarding operating features of the type 6700B, along with controls on the r.f. plug-in unit, is provided in the following paragraphs. A complete understanding of these considerations and their effects is recommended before using the instrument as a signal source.

APPLYING POWER

5. When the toggle switch at the left-hand end of the front panel is moved to the 'up' position, the neon indicator above the switch will light indicating that the instrument is ready to operate provided that an r.f. unit is installed. There is no waiting period for operation.

SWEEP TIMES

Automatic

6. One of four automatic sweep times can be selected by setting the SWEEP TIME (SEC) control to either .01, .1, 1 or 10 and setting the SWEEP FUNCTION control to M1-M2, F1-F2 or SYM M1. The SWEEP TIME (SEC) settings are only accurate when the VARIABLE control is set to CALIBRATED (fully clockwise). Rotating the VARIABLE control from fully clockwise to fully anti-clockwise

increases the sweep time to ten times the interval indicated (.01, .1, 1 or 10) with a maximum sweep time for 100 seconds. The SWEEP ON indicator will light during the forward portion of the sweep.

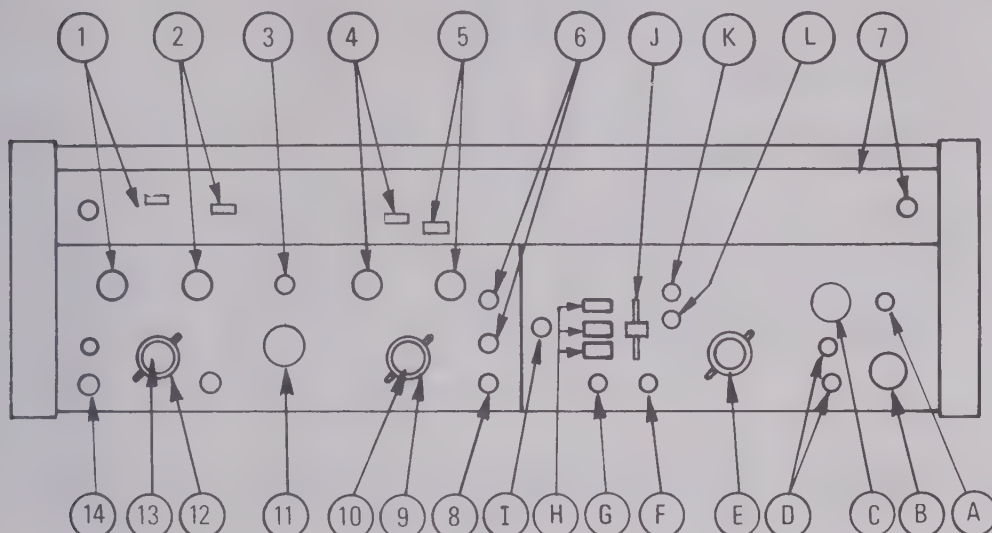


Fig. 1 Front panel controls and connectors

- (1) F1 control and marker: Determines starting frequency for F1-F2 setting of SWEEP FUNCTION control and marker frequency in remaining settings except for CW M1 and EXT/M1.
- (2) M1 control and marker: Determines (a) marker frequency for F1-F2, (b) sweep starting frequency for M1-M2, (c) centre frequency for SYM M1, and (d) sweep starting frequency for EXT/M1 positions of SWEEP FUNCTION control.
- (3) SWEEP ON: Indicator lights during forward trace only of internally generated sweep, but is inoperative in manual sweep mode.
- (4) M2 control and marker: Determines (a) second marker frequency for F1-F2, (b) the only marker frequency for EXT/M1, and (c) sweep limit frequency for M1-M2 positions of SWEEP FUNCTION control.
- (5) F2 control and marker: Determines (a) sweep limit frequency for F1-F2, and (b) marker frequency for both M1-M2 and SYM M1 settings of SWEEP FUNCTION control.
- (6) 1 kHz $\square$ ON switch and adjustment: Controls voltage to square wave generator; adjustment varies frequency of square wave.
- (7) Frequency scale and retaining screws: .350 mm scale (one per r.f. unit). Keyholes in scale locate over screws on front panel.

- (8) SWEEP OUT: Connector provides a linear d.c. ramp voltage for driving the horizontal axis of oscilloscope or chart recorder.
- (9) SWEEP TIME (SEC): Selects one of four sweep times; also selects manual mode.
- (10) SWEEP TIME (SEC) VARIABLE: Vernier provides adjustment of selected sweep time; Fully anti-clockwise setting increases sweep time by a factor of 10. In the manual mode, the vernier is used to vary the sweep manually.
- (11) SWEEP FUNCTION: Selects an internal mode, CW or external frequency (voltage) command.
- (12) TRIGGER: Selects either AUTO, LINE, EXT or manual push-button mode for initiating the sweep.
- (13) MARKER AMPLITUDE: Provides continuous amplitude adjustment for video and r.f. markers.
- (14) SUPPLY ON: Controls a.c. line power; up for ON. Neon indicator immediately above.
- (A) UNLEVELLED: Indicator lights when r.f. output is not levelled across the entire frequency range in use.
- (B) RF OUTPUT: Connector provides r.f. output signal.
- (C) RF LEVEL control: Knob sets amplitude of r.f. output.
- (D) RF ON-OFF switch and indicator: Controls V_{cc} to r.f. unit; indicator lights when r.f. unit is operating.
- (E) SYMMETRICAL SWEEP WIDTH controls: Select one of nine calibrated sweep widths. Vernier provides adjustment of the sweep width in 0-100% position only.
- (F) EXT DET INPUT: Input connector for external levelling signal.
- (G) GAIN: Adjustment controls leveller gain in the power meter mode.
- (H) LEVELLER MODE controls: Select one of three basic modes of operation: OFF, INTERNAL or EXTERNAL. (Internal levelling available only with Option-1.)
- (I) LOCK: Captive screw secures r.f. unit in mainframe.

Additional features on type 6790A only

- (J) Band switch: Selects 0.01-1 GHz, 1-2 GHz or 0.01-2 GHz band.
- (K) Band indicator: Lights when frequency is in 0.01-1 GHz band.
- (L) Band indicator: Lights when frequency is in 1-2 GHz band.

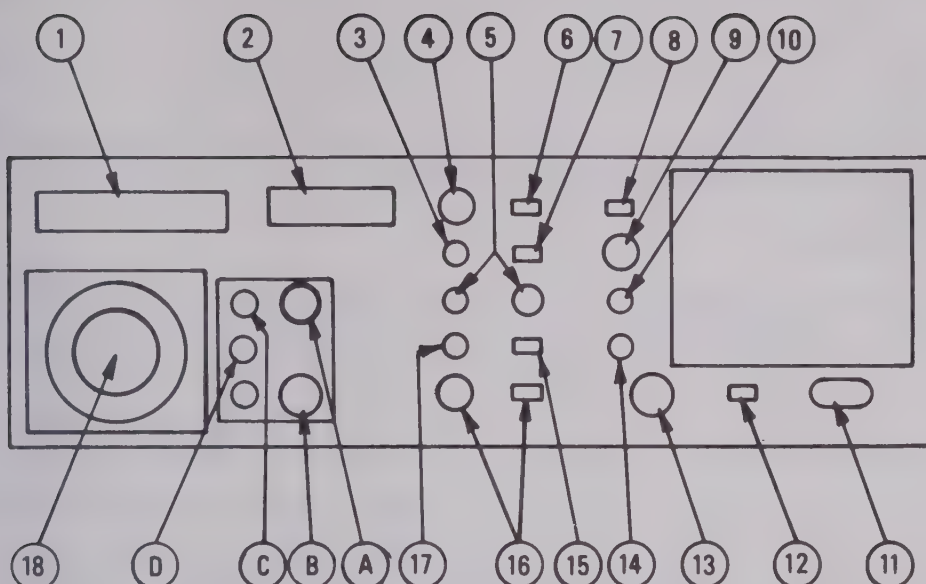


Fig. 2 Rear panel controls and connectors

- (1) TB1: Terminals 1 and 2, 8 and 9, 10 and 11, are normally shorted. Terminals 6 to 11 are for remote frequency control.
- (2) REMOTE PROGRAMMING input: Input connector for remote digital b.c.d. control of output frequency (if Option-01 is included) and remote RF ON/OFF control.
- (3) BLANKING OUTPUT: Connector provides a negative pulse during retrace and prior to initiation of next trace; also during automatic band switching in 0.01-2 GHz operation of type 6790A.
- (4) EXT SWEEP INPUT: Input connector for 0 to +10 V external sweep command.
- (5) DISPLAY SWEEP OUTPUT and AMPLITUDE: Output is identical to front panel SWEEP OUT; control adjusts amplitude of both front and rear panel SWEEP OUTPUT signals.
- (6) SWEEP RESPONSE TIME: Switch controls bandwidth of tuning supply. In AUTO the bandwidth is automatically adjusted according to rate of change of the input voltage; in FAST the bandwidth always remains at its widest except in CW operation.
- (7) RF DURING RETRACE: Switch provides a choice of RF ON or OFF during retrace.

- (8) SYM MARKERS/DWELL TIME: Switch selects CALIBRATED markers, read from the frequency scale, or RELATIVE markers of constant narrow width in SYM M1 mode. It also gives choice of pre-sweep dwell-time - SHORT (normal) or LONG for compatibility with network analysers.
- (9) PEN LIFT: Terminal provides a relay closure signal during forward trace.
- (10) EXT $\square$ INPUT: Input connector for external square-wave modulation of r.f.; - 10 V turns off r.f. power.
- (11) AC SUPPLY: 3 - wire male connector.
- (12) AC INPUT SELECTOR: Switch selects 105-125 V or 210-250 V operation.
- (13) AC input fuse: 115 V / 3.15 A or 230 V / 1.6 A. Anti-surge fuses, 20 mm x 5 mm.
- (14) EXTERNAL TRIGGER: Connector for -10 V input trigger signals.
- (15) MARKER switch: In ON position, markers appear as amplitude dips on the r.f. output.
- (16) PROPORTIONAL OUTPUT and switch: Connector provides a voltage proportional to the frequency of the instantaneous r.f. output. Switch selects either 10 V / BAND or 40 V / OCTAVE scale factor for the proportional output voltage.
- (17) VIDEO OUTPUT: Connector provides a negative signal when the r.f. and marker frequencies coincide. MARKER switch does not affect this output.
- (18) Cooling fan: Blows cold air on to r.f. unit heat sink.
- (A) J1: Input connector for a remote tuning input. (Remove external jumper between pins A, B) and (for type 6790A only) REMOTE band selection.
- (B) RF OUTPUT: This connector only present on r.f. units with "R" option.
- (C) AM INPUT: Input connector for amplitude modulation signals.
- (D) FM INPUT: Input connector for frequency modulation and phase locking signals.

SWEEP TRIGGER SELECTION

Automatic

7. With the TRIGGER selector set to AUTO, the sweep is automatically re-started upon completion of a retrace, i.e. recurrent free-running operation. A short dwell time is provided at the start and finish of each trace to allow r.f. frequency and power to stabilise. A switch position is provided to increase the pre-sweep dwell when the 6700B is used in conjunction with a network analyser.

Line

8. In the LINE position, a sweep is triggered by the occurrence of the next line frequency cycle following completion of retrace.

External

9. Setting the TRIGGER selector to EXT allows a -10 V signal, applied to the EXTERNAL TRIGGER connector on the rear panel, to start a new sweep upon receipt of the next negative going external trigger signal following completion of retrace.

Single sweep

10. Rotating the TRIGGER selector fully clockwise and pressing the adjacent button generates a single sweep.

SWEEP FUNCTION MODES

F1 - F2 mode

11. With the SWEEP FUNCTION selector set to F1 - F2, the output frequency sweeps between the limits set by the F1 and F2 controls. Normally the low frequency limit is set by F1 and the high limit by F2, resulting in a sweep that goes from a low to a higher frequency. However, F1 can be used to set the high limit and F2 the low limit, thereby establishing a high to low frequency sweep. The electronic YIG lag compensation will not be operative when sweeping from a high to a low frequency.

12. Two calibrated markers are controlled by the M1 and M2 controls when in the F1 - F2 sweep mode, each continuously adjustable over the entire frequency range.

M1 - M2 mode (expanded sweep)

13. The M1 and M2 markers provide the means of selecting any portion of the F1 - F2 frequency range for expanded display. With the SWEEP FUNCTION selector set to F1 - F2 mode, adjust the M1 and M2 controls to position the M1 and M2 markers at either side of the range to be expanded. Then, when the sweep function selector is switched to the M1 - M2 mode, the frequency range established by the two markers covers the full width of the swept frequency display.

SYM-M1 mode (symmetrical sweep)

14. Setting the SWEEP FUNCTION selector to SYM M1 and adjusting the M1 control to position the M1 marker to the desired centre frequency will cause the trace to sweep symmetrically about that centre frequency. The total sweep width (peak-to-peak excursion) is determined by the setting of the SYMMETRICAL SWEEP WIDTH control located on the front panel of the r.f. unit.

15. When the SYM MARKERS switch, located on the rear panel, is set to CALIBRATED, F1 and F2 markers are directly calibrated by the frequency scale and cover the entire frequency range of the r.f. unit. Positioning the SYM MARKERS switch to RELATIVE causes the markers to become quite narrow, ranging only over the symmetrical sweep frequency width in use. However, frequency scale calibration does not apply to the markers in this condition.

16. The symmetrical mode is convenient for making narrowband measurements since the frequency excursion is calibrated to within $\pm 3\%$ (for YIG tuned r.f. units, and $\pm 10\%$ for varactor tuned r.f. units) of the SYMMETRICAL SWEEP WIDTH range selected. For narrow sweep widths, this is substantially more accurate than the markers. The SYMMETRICAL SWEEP WIDTH selector provides nine convenient steps from approximately 0.2% to 100% of the sweep range for the r.f. unit. Rotating the selector fully clockwise activates the concentric control which is used to vary the sweep width continuously over the full frequency range.

17. The symmetrical mode may also be used as an expansion of the F1 - F2 mode, when the M1 marker is set to the centre of that portion of the F1 - F2 display to be expanded.

18. The centre frequency may also be remotely determined via the terminal strip (TB1 in Fig. 2) located on the rear panel. When jumpers linking terminals 8 to 9 and 10 to 11 are removed, remote voltage from 0 to -10 V (applied to terminal 9 with respect to terminal 7) will linearly control the centre frequency over the full range. A potentiometer (1 k Ω recommended) or a resistor divider placed at terminals 7, 9 and 11 will also determine the centre frequency over its full range.

19. If several centre frequencies are required, an external switch or push-button control can be used to select from a number of remote control voltages, potentiometers or resistor divider networks.

CW M1 Mode

20. When the SWEEP FUNCTION selector is set to the CW M1 position, the automatic sweep mode is disabled and the output frequency is determined by the setting of the M1 control. The SWEEP ON indicator does not function in this mode.

21. With the SWEEP FUNCTION selector set to F1 - F2, the M1 marker may be preset to a frequency of interest. When the SWEEP FUNCTION selector is placed in the CW M1 position, the r.f. output will automatically be at the frequency identified by the position of the M1 marker.

22. Remote frequency control may be accomplished via the rear terminal strip as described in para. 18.

EXT/M1 Mode

23. When the SWEEP FUNCTION selector is set to the EXT/M1 position, the automatic sweep is disabled and the output frequency is determined by an external voltage applied to the EXT SWEEP INPUT connector (located on the rear panel) and the setting of the M1 control. An analog voltage from 0 to +10 volts will control the frequency over the entire range of the r.f. unit. The SWEEP ON indicator does not function in this mode.

24. One calibrated marker, M2 set by the M2 control, is continuously adjustable over the entire range.

SWEEP RESPONSE TIME CONTROL

25. With the SWEEP RESPONSE switch (located on the rear panel) set to AUTO, the response (bandwidth) of the tuning supply is automatically adjusted according to the rate of change of the input tuning voltage - whether internally or externally generated. In this manner, a minimum noise bandwidth is maintained to ensure the lowest possible residual f.m. regardless of sweep rate. Setting the SWEEP RESPONSE to FAST forces the bandwidth to remain at its widest at all times, except when the SWEEP FUNCTION switch is set to CWM1.

RF LEVEL

26. The continuously variable RF LEVEL control (front panel) is used to vary the amplitude of the r.f. output. Maximum r.f. output level is obtained by rotating the RF LEVEL fully clockwise. The LEVELLER MODE OFF pushbutton should be depressed unless levelled power is to be used.

RF POWER LEVELLING

General considerations

27. The type 6700B, with any r.f. unit installed, is capable of maintaining a constant amplitude r.f. output across the frequency range. This is accomplished by comparing the d.c. level from an r.f. amplitude sampling device with the amplitude command of the RF LEVEL control. The difference (or error) is amplified and applied to a current-controlled attenuator which reduces the amplitude of the r.f. output to the desired level.

28. The RF LEVEL control sets the maximum amplitude of r.f. power across the frequency range. Consequently, the r.f. output will be levelled in those portions of the frequency band where there is sufficient r.f. power but will remain unlevelled in any portion where the amplitude of the r.f. power falls below the level demanded by the RF LEVEL control. The UNLEVELLED indicator will only be illuminated during those portions of the sweep that are not levelled.

Internal levelling

29. No external equipment is required to provide levelled r.f. power when using an r.f. unit featuring internal levelling circuitry. These units have an internal directional detector consisting of a flat broadband directional coupler with a crystal detector. To activate the internal levelling function, simply depress the front panel LEVELLER MODE INT pushbutton and adjust the RF LEVEL control so that the UNLEVELLED indicator lamp remains extinguished over the frequency range in use.

External crystal levelling

30. The output from any r.f. unit may be levelled by using a remote r.f. amplitude sampler. This is especially desirable at the higher microwave frequencies to ensure flat power at the input to the device under test. External levelling is also used to remove any power variations which may otherwise be introduced by a device inserted in the r.f. path such as a filter, an amplifier or a long transmission line.

31. A broadband directional coupler (typically 10 dB) and crystal detector are connected in the r.f. path to take a sample of the r.f. power. The detector output is connected to the front panel EXT DET INPUT socket on the r.f. unit and the LEVELLER MODE EXT button depressed. Either positive or negative polarity detectors may be used.

32. For optimal results over a frequency range of less than 2:1, a low-pass filter with cut-off frequency at the high end of the desired band may be inserted before the directional coupler. The influence which any small harmonic content of the r.f. signal might have on levelling is thus minimized.

Power meter levelling

33. The ultimate in levelling accuracy and flatness across a broad band is obtained by substituting a thermistor r.f. power meter for the crystal detector as discussed in para.31. The long response time, however, of power meter thermistor mounts restricts Sweep Time selection to the two slower ranges, 1 s and 10 s, of the SWEEP TIME (SEC) control. These two ranges are also suitable for use in conjunction with an X-Y recorder or with oscilloscopes other than the long persistence display types.

34. The power meter should have a minimum output of 1 V or 1 mA. Either polarity may be used. Typically, a 10 dB directional coupler and a low pass filter are used in the same manner as described in para.31. A levelled output power indication is calculated by adding the directional coupler's coupling factor in dB to the power meter indication. The output power indication is influenced by both the front panel RF LEVEL control setting, and the range selected for the power meter. It might be necessary to re-adjust the GAIN control when changing settings of the power meter range switch. The GAIN control on the front panel is only operative in the POWER METER MODE of levelling. The XTAL/PWR MTR slide switch, accessible through a hole in the top cover of the r.f. unit, must be moved to the PWR MTR position.

35. When square wave modulation is used, the levelling action of the power meter maintains constant (average) power. Since the duty factor of the internal square wave is 50%, the peak r.f. power will be twice the value indicated by the average reading on the power meter.

36. To minimize transients at the start of the sweep, it is recommended that the RF DURING RETRACE switch (located on the rear panel) be moved to ON. Refer to para.39 for more details.

FREQUENCY MARKERS

37. Two independent calibrated frequency markers are generated for each sweep mode except for the EXT/M1 mode. These markers are available as negative video signals at the VIDEO MARKER OUTPUT connector located on the rear panel. The marker waveforms may be displayed on the second channel of a dual trace oscilloscope, or on an X-Y recorder, or used as an oscilloscope intensity variation signal.

38. Setting the RF MARKER switch (rear panel) to ON causes the r.f. markers to be displayed as sharp dips in r.f. power. Marker amplitude is varied by the continuously adjustable MARKER AMPLITUDE control located on the front panel.

BLANKING DURING RETRACE

39. When the RF DURING RETRACE switch (rear panel) is set to OFF, the r.f. power is greatly attenuated during retrace of the internally generated sweep. This feature provides a near-zero power reference base line for the r.f. display. Dwell time is also provided at both start and finish of sweep. Setting the switch to ON provides r.f. power during both trace and retrace. This is useful to power meter levelling set-ups and for chart recorder operation since it eliminates large changes in amplitude at the beginning and end of sweep.

40. A negative video pulse, covering the whole retrace and dwell periods, is present at the BLANKING OUTPUT connector. In addition, a contact closure during forward trace is available at the PEN LIFT terminal for use with recorders having the capability to discontinue writing during retrace. The PEN LIFT contacts automatically remain open in MANUAL sweep mode, the .1 and .01 s SWEEP TIME settings, and when primary power is OFF.

AMPLITUDE MODULATION

Internal square wave

41. The internal 1k kHz square wave generator, especially useful with a tuned detection amplifier, may be activated in any mode by setting the 1 kHz $\square$ switch to ON. The associated front panel screwdriver adjustment provides the means to change the frequency over a range from 950 to 1050 Hz. The oscillator, which provides 100% modulation, allows a peak power identical with square-wave-off power except when using the power meter levelling when the average power remains the same and may require resetting the RF level control to maintain peak power within the r.f. unit's maximum output capability.

External, a.m.

42. An external amplitude modulating signal may be applied to the AM INPUT connector located on the rear panel of the r.f. unit. External modulation signals are mixed directly with the output of the RF LEVEL control circuit. Amplitude distortion of the modulation is minimal when XTAL levelling is used. Power will remain linear with an external amplitude modulating signal when power meter levelling is employed, but frequency response is somewhat limited. Adjusting the RF LEVEL CONTROL will centre the dynamic range of the amplitude modulation.

External pulse

43. Pulse modulation input signals may be applied to the AM INPUT on the rear panel of the r.f. unit. When using the AM INPUT, a positive going voltage increases the power level above that value set by the RF LEVEL CONTROL (unless LEVEL CONTROL is fully clockwise) and a negative going signal decreases power below the value set by the level control. Rise and fall times of approximately 2 μ s are possible when using the AM INPUT connector. The LEVELLER MODE OFF button should be depressed.

DISPLAYING SWEEP FREQUENCY MEASUREMENTS

44. For rapid evaluation or adjustment of a device under test, the oscilloscope is generally the most convenient display method. A simple set-up using a broadband crystal detector, a pad and an oscilloscope is illustrated in Fig. 3.

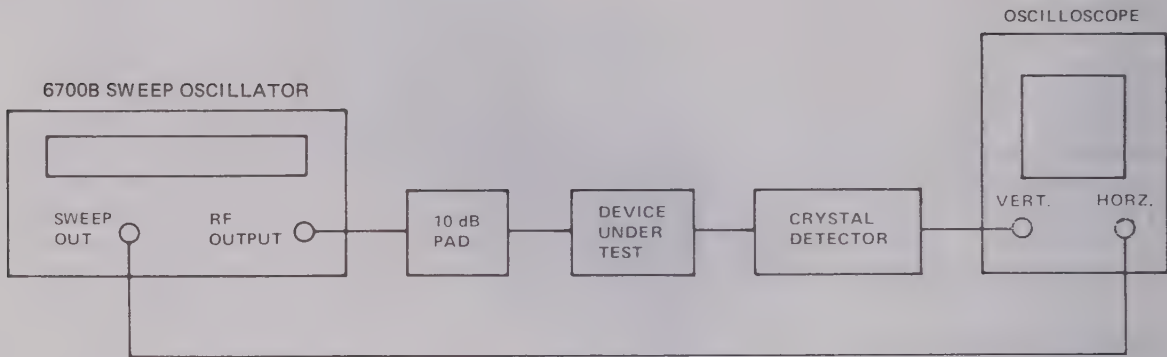


Fig. 3 Swept frequency measurement test set-up using an oscilloscope display

45. The r.f. output, after passing through the pad and the device under test, is converted to a video signal by the crystal detector and applied to the vertical input of the oscilloscope. The pad is used to provide a proper source match and to reduce the power level so that the detector operates within its square law region. A sweep signal from either the front panel SWEEP OUTPUT connector or the rear panel DISPLAY SWEEP OUTPUT connector is used to provide the horizontal drive for the oscilloscope. The DISPLAY SWEEP AMPLITUDE control located on the rear panel of the mainframe, or the horizontal gain control on the oscilloscope, may be used to adjust the display width. Measurements will be enhanced by levelling, as discussed in para. 27.

46. An X-Y recorder may also be used to obtain a permanent record of the evaluation or adjustment of the device under test. As shown in Fig. 4, the test set-up using the recorder is very similar to the one for the oscilloscope. The SWEEP TIME (SEC) control must be set to either 1 or 10 and the vernier adjusted to meet the response time of the recorder. If the recorder has a pen lift or equivalent writing enable-disable feature it should be connected to the rear panel PEN LIFT terminals on the type 6700B to prevent chart marking during retrace.

47. The recorder X and Y scale factors and zero suppression may be conveniently adjusted by setting the SWEEP TIME (SEC) selector to MAN and rotating the associated concentric VARIABLE control knob.

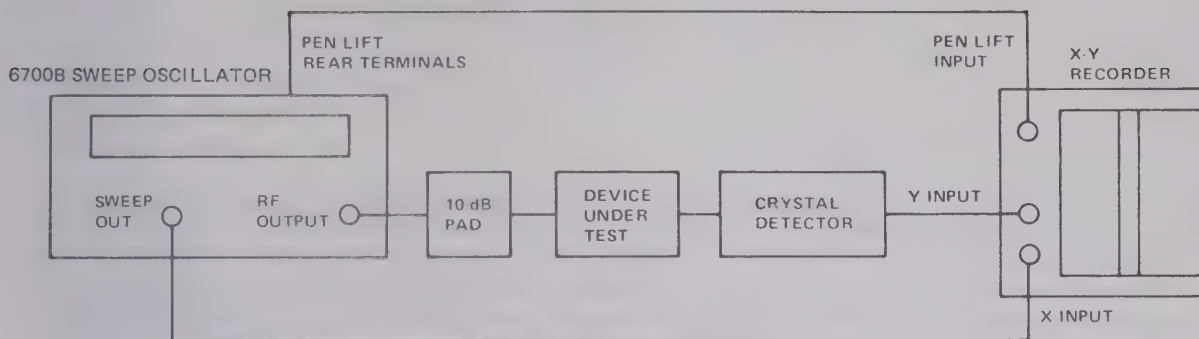


Fig. 4 Swept frequency measurement test set-up using an X-Y recorder display

REMOTE CONTROL OF FREQUENCY AND AMPLITUDE

48. The type 6700B Sweep Oscillator may be remotely controlled by using an external negative or positive going analogue voltage, a potentiometer, or b.c.d. logic level (Option-01) to determine the output frequency and the power level. Wideband remote frequency control e.g. phase locks, must be applied via the r.f. unit rear panel FM INPUT connector. Frequency deviation is superimposed on the output frequency determined by the other inputs and controls.

Frequency - analogue voltage control

49. Remote control of the output frequency through the use of a 0 to +10 volt signal, that may be either d.c. or a special waveform, is accomplished by setting the SWEEP FUNCTION selector to EXT/M1 and applying the input control voltage to the rear panel EXT SWEEP INPUT connector. The F1 and F2 controls are inoperative but the M2 control still sets the M2 marker. In this mode the M1 control determines the 0 V start frequency.

50. To effect frequency control by using a 0 to -10 V signal requires setting the SWEEP FUNCTION selector to CW M1, or if the remote signal is being modulated, set the SWEEP FUNCTION SELECTOR TO SYM M1. Remove the jumper from terminals 8 and 9 of TB-1 (located on the rear panel) and connect the input signal to terminal 9 and the signal return to terminal 7. (If a shielded cable is used, connect the shield to terminal 6). The internal electronic sweep provides a calibrated symmetrical sweep, having its width set by the SYMMETRICAL SWEEP WIDTH control located on the r.f. unit, which sweeps about the centre frequency determined by the input control voltage. The M1 control is ineffective; F1 and F2 controls still provide markers. If desired, the internal electronic sweep may be disabled by setting the SWEEP TIME (SEC) selector to MAN, or by setting the TRIGGER selector to EXT and positioning the SYMMETRICAL SWEEP WIDTH control fully anti-clockwise.

51. Rear panel connector J1 on the r.f. unit may also be used as an input for a remote control voltage. The input may be used alone or in conjunction with any of the remote control techniques being discussed.

52. A voltage applied to pins A and B (signal to B and return to A) of connector J1 operationally adds to the output frequency in every mode. This feature may be especially convenient when used as a vernier control about a preset frequency. A 10 V change covers the entire frequency band of the r.f. unit with an increase in frequency corresponding to a more positive voltage level.

Frequency - resistance control

53. Controlling the output frequency by means of external resistors is accomplished by connecting a resistance divider or a potentiometer (1 k Ω recommended) to terminal strip TB1 located on the rear panel. Connect the external resistance to terminals 7, 9 and 11 as illustrated just below the terminal strip. Set the SWEEP FUNCTION selector to CW M1, or if the remote signal is being modulated, set the SWEEP FUNCTION selector to SYM M1. The internal sweep provides a calibrated symmetrical sweep, having a width set by the SYMMETRICAL SWEEP WIDTH CONTROL located on the r.f. unit, that sweeps about the centre frequency determined by the input control signal. The M1 control is ineffective; F1 and F2 controls still provide normal markers. The automatic sweep may be disabled by setting SWEEP TIME (SEC) to MAN or by setting the TRIGGER selector to EXT. Since the remote resistance divider replaces the function of the M1 control, this type of set-up permits remote marker control in the F1 - F2 mode, and remote sweep start control in the M1 - M2 mode.

Frequency - digital control

54. To implement remote control via externally generated digital signals requires that Option-01, which is a plug-in p.c. card, be installed in the mainframe (see 6700B mainframe manual). The REMOTE PROGRAMMING INPUT connector, a 36-pin rear panel mainframe connector, provides twelve digital input lines for a remotely generated 3-digit b.c.d. word used to determine the frequency. One input line, Remote Enable, is provided to control the mode of operation - either local or remote. A second input line is provided for strobing the 12-line, 3-digit b.c.d. input lines. If the strobe line remains open (a logic "1" condition) any 12-bit word present at the input lines will determine the output frequency. Placing a ground (a logic "0" condition) on the strobe line causes the unit to hold the last 12-bit word, regardless of the state of the 12-input lines, until the strobe line changes to a logic "1" condition. This feature allows a given 12-bit word, corresponding to a specific frequency, to be held in memory as long as the strobe input line remains at a logic "0", even though the digital word on the 12 lines may be changing.

55. One additional line is provided for remote control of the RF ON/OFF switch on the front panel of the r.f. unit. Applying +5 V to this line shuts off the r.f. source power; leaving the line open or at 0 V turns on the r.f. source power so long as the RF ON/OFF toggle switch on the front panel is set to ON. This line is standard equipment on the type 6700B and is not part of Option-01 for the mainframe.

RF amplitude - voltage and resistance control

56. The amplitude of the r.f. output signal is easily controlled by simply applying a command input voltage to the AM INPUT connector located on the rear panel. An analogue voltage of either 0 to +5 V or 0 to -5 V, will cause the amplitude to change across its entire range with a negative going voltage

corresponding to a decrease in the output power level. The power level will vary around the setting of the RF LEVEL control according to the a.m. input signal.

FREQUENCY MODULATION

External f.m.

57. An external frequency modulating signal may be applied to the FM INPUT connector located on the rear panel of the r.f. unit. Positive-going voltages cause the frequency to increase with respect to the centre frequency and negative-going voltages cause the frequency to decrease with respect to the centre frequency. For this mode of operation, the SWEEP FUNCTION SELECTOR switch on the front panel of the mainframe should be set to the SYM M1 position; the SWEEP TIME switch set to MAN and the SWEEP RESPONSE TIME slide switch on the rear panel of the mainframe should be set to FAST. Set the SYMMETRICAL SWEEP WIDTH switch on the plug-in unit to the fully anti-clockwise position. The M1 control will be used to set the centre frequency. The input impedance at this port is approximately 5 k Ω to ground. The input/output relationship for YIG tuned r.f. units is as follows:-

6738A	20 MHz/V
6742A	20 MHz/V
6754A	40 MHz/V
6766A	44 MHz/V
6774A	56 MHz/V

A typical figure for varactor-tuned units (6730A and 6790A) is 10 MHz/V.

Phase locking

58. Phase locking is possible by applying the error signal from an external frequency stabilizer to the FM INPUT connector. For this mode of operation, the SWEEP FUNCTION selector switch on the front panel of the mainframe should be set to the SYM M1 position, the SWEEP TIME switch set to MAN and the SWEEP RESPONSE TIME slide switch on the rear panel of the mainframe should be set to FAST. Set the SYMMETRICAL SWEEP WIDTH switch on the plug-in unit to the fully anti-clockwise position.

59. It may be found that phase-lock is more easily accomplished, and the resulting r.f. signal freest from sidebands, if the error signal from the Frequency Stabilizer is reduced by a potentiometer (10 k Ω recommended) or simply a series resistor of up to 10 k Ω .

Remote band selection (6790A only)

60. For the three operating bands of the r.f. unit type 6790A, facilities are provided for band selection by the front-panel lever switch or via the 10-pin connector on the rear panel. For selection via this connector, the front-panel switch is set to REMOTE and t.t.l. - compatible logic signals applied to the connector as follows:-

<i>Pin C</i>	<i>Pin D</i>	<i>Band selected</i>
Open or +5 V	Open or +5 V	0.01 - 2.0 GHz
Ground (0 V)	Open or +5 V	0.01 - 1.0 GHz
Open or +5 V	Ground (0 V)	1.0 - 2.0 GHz

Compatibility with network analysers

61. When operating at maximum sweep rates, the rear panel SYM MARKERS / DWELL TIME switch should be moved to the RELATIVE/LONG position in order to secure best synchronization between sweeper and analyser.

62. If the analyser is of the type which does not include automatic blanking whenever the r.f. signal is not being swept, the rear-panel BLANKING OUTPUT signal should be connected to the Z-blanking input of the analyser in order to avoid spurious movements of the spot on the display tube during retrace and dwell periods.

Chapter 4

TECHNICAL DESCRIPTION

CONTENTS

Para.

1	Introduction
2	Summary of standard system
6	Summary of 6790A RF Unit heterodyne system
10	Circuit descriptions
11	Tuning supply, YIG
27	Levelling circuit
42	Bias supply
53	FM input circuitry for YIG - tuned r.f. source
55	Heat exchanger
57	Remote tuning
60	Heterodyne unit control logic (6790A only)
66	Tuning waveforms
67	Comparator
69	Composite tuning voltage generator

Table

1	Control logic for 6790A	...	...	...	...	...
---	-------------------------	-----	-----	-----	-----	-----

Page
21

Fig.

1	Block diagram of type 6700B mainframe and r.f. unit	...	2
2	Block diagram of RF Unit type 6790A	... ..	4
3	Simplified circuit diagram of YIG tuning supply	... ..	5
4	Simplified circuit diagram of sweep delay compensation	... ..	7
5	Simplified circuit diagram of automatic tuning supply bandwidth	... ..	8
6	Simplified circuit diagram of differentiator	... ..	9
7	Simplified circuit diagram of absolute value generator	... ..	9
8	Simplified non-linear amplifier	... ..	10
9	Varactor tuning supply	... ..	11
10	Simplified block diagram of r.f. leveller	... ..	12
11	Power meter levelling stabilization circuit	... ..	14
12	Block diagram of auto-polarity network	... ..	15
13	Simplified circuit diagram of bias supply	... ..	16
14	Crowbar circuit	... ..	18
15	FM input circuit	... ..	18
16	Heat exchanger circuit	... ..	19
17	Block diagram of control logic for 6790A	... ..	20
18	Tuning and blanking waveforms for 6790A	... ..	22
19	Functional relationships	... ..	23
20	Comparator circuit	... ..	24
21	Composite tuning voltage generator	... ..	25

INTRODUCTION

1. This section contains a block level description of the type 6700B sweep system and a detailed description of individual circuits. Complete circuit diagrams are provided in Chap. 7.

SUMMARY OF STANDARD SYSTEM

2. The type 6700B mainframe, as shown in Fig. 1, contains sweep generating circuitry consisting of a sweep trigger, sawtooth oscillator, sweep limiter and sweep amplifiers; a frequency marker generator; a square wave generator (for internal amplitude modulation); and a power supply section for generating the various voltages required for both the mainframe and the r.f. unit.

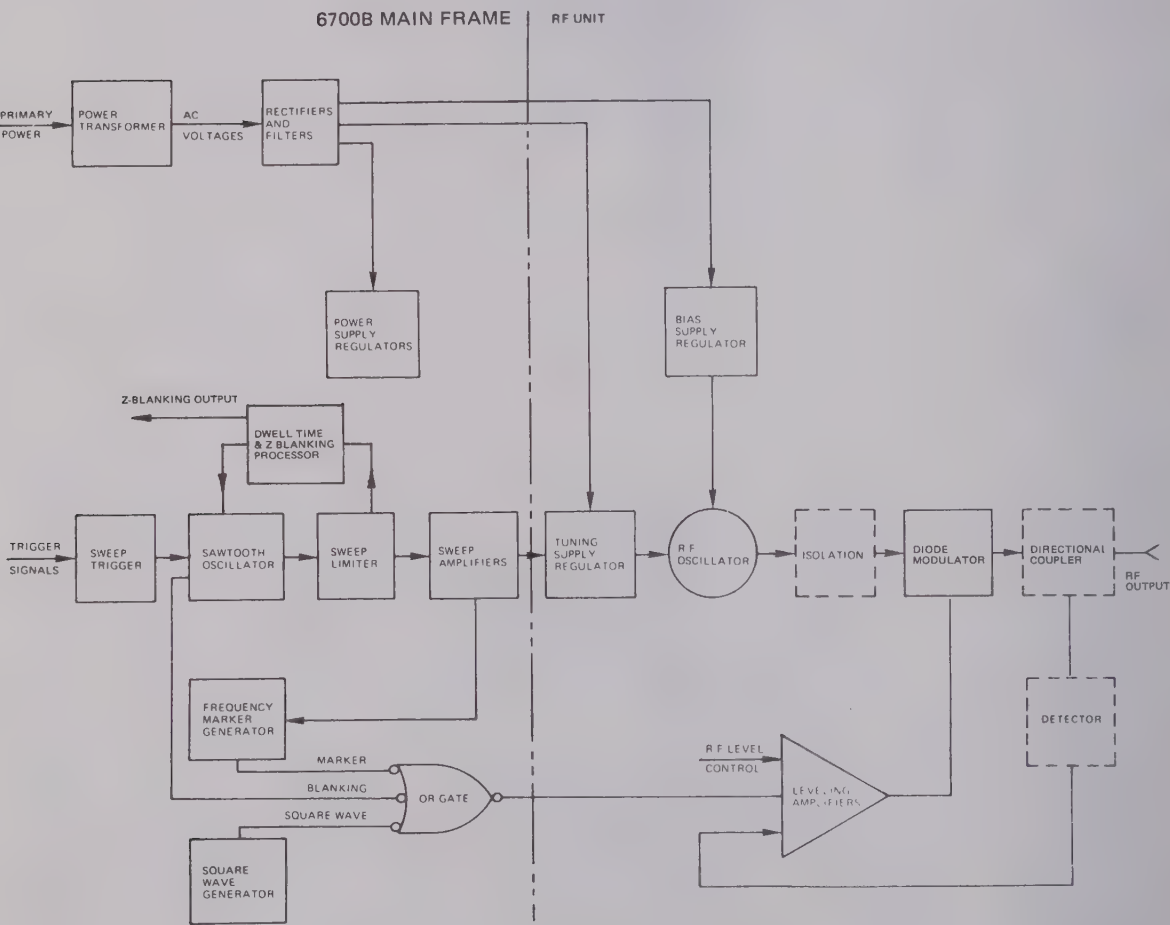


Fig. 1 Block diagram of type 6700B mainframe and r.f. unit

3. The function of the sweep trigger circuit is to reshape and standardize the negative going input trigger signal. The resultant positive output pulse is used to trigger the sawtooth generator which in turn develops a negative sawtooth voltage. This 0 to -12 V waveform, after being inverted and limited to 0 V to +10 V by the sweep limiters, is applied to the sweep amplifiers which modify the positive going waveform in accordance with the front panel control settings. The modified output from the sweep amplifiers is used to drive the tuning supply regulator which in turn controls the r.f. oscillator. As a result, the oscillator sweeps only that portion of its frequency range which corresponds to the output waveform from the sweep amplifiers.

4. The amplitude of the r.f. output is determined by the electronically controlled attenuation of the diode modulator located in the r.f. unit. The levelling amplifiers section drives the modulator with a control current determined by the setting of the RF LEVEL control. When levelling is in operation, a portion of the r.f. output is sampled by the directional coupler, detected and fed back to the levelling amplifiers as a negative feedback control signal. As the output frequency is varied the levelling control loop maintains the detector output at a constant level. The amplitude variation of the r.f. output, therefore, depends only on the characteristics of the directional coupler/detector combination.

5. The frequency marker generator circuit compares a sweep voltage with the marker control voltage to develop marker signals at the corresponding r.f. frequencies. The square wave generator, the retrace blanking signal and the markers, when individually activated by front or rear panel controls, are gated through the OR gate and applied to the levelling amplifiers as modulation.

SUMMARY OF 6790A RF UNIT HETERODYNE SYSTEM

6. The 6790A RF Unit is a dual-band plug-in covering 10 MHz to 1 GHz in one band and 1 GHz to 2 GHz in the other. A 1.0-2.1 GHz oscillator is used to provide direct output of 1-2 GHz and is swept downwards from 2.09 GHz to 1.1 GHz while its output is heterodyned with that of a 2.1 GHz local oscillator to produce 10 MHz to 1 GHz. In the broadband mode, 10 MHz - 2 GHz, switching from one band to the other is accomplished automatically at 1 GHz with all-solid-state switching.

7. In the block diagram of Fig. 2, switches are shown in the positions relating to 10 MHz - 1 GHz operation. The local oscillator gives the high level 2.1 GHz signal to the mixer whereas that from the 2.09 - 1.1 GHz v.t.o. is attenuated to a low level. Consequently, the output level from the mixer is proportional to that of the v.t.o. which is controlled by a built-in p.i.n. diode modulator. Immediately following the v.t.o. and its modulator is a 2.1 GHz low-pass filter to reduce harmonic output and thereby reduce undesirable mixing products which appear as in-band spurious signals in the final output. A 1 GHz low-pass filter reduces direct mixer feedthrough from each of the oscillators and also reduces out-of-band spurious mixing products.

8. The 10 MHz to 1 GHz signal is then amplified and fed to a directional coupler where a sample of the r.f. is detected and routed to the input of the main levelling amplifier to complete the levelling feedback loop. The levelled output is then passed via p.i.n. diode switches to the r.f. output connector.

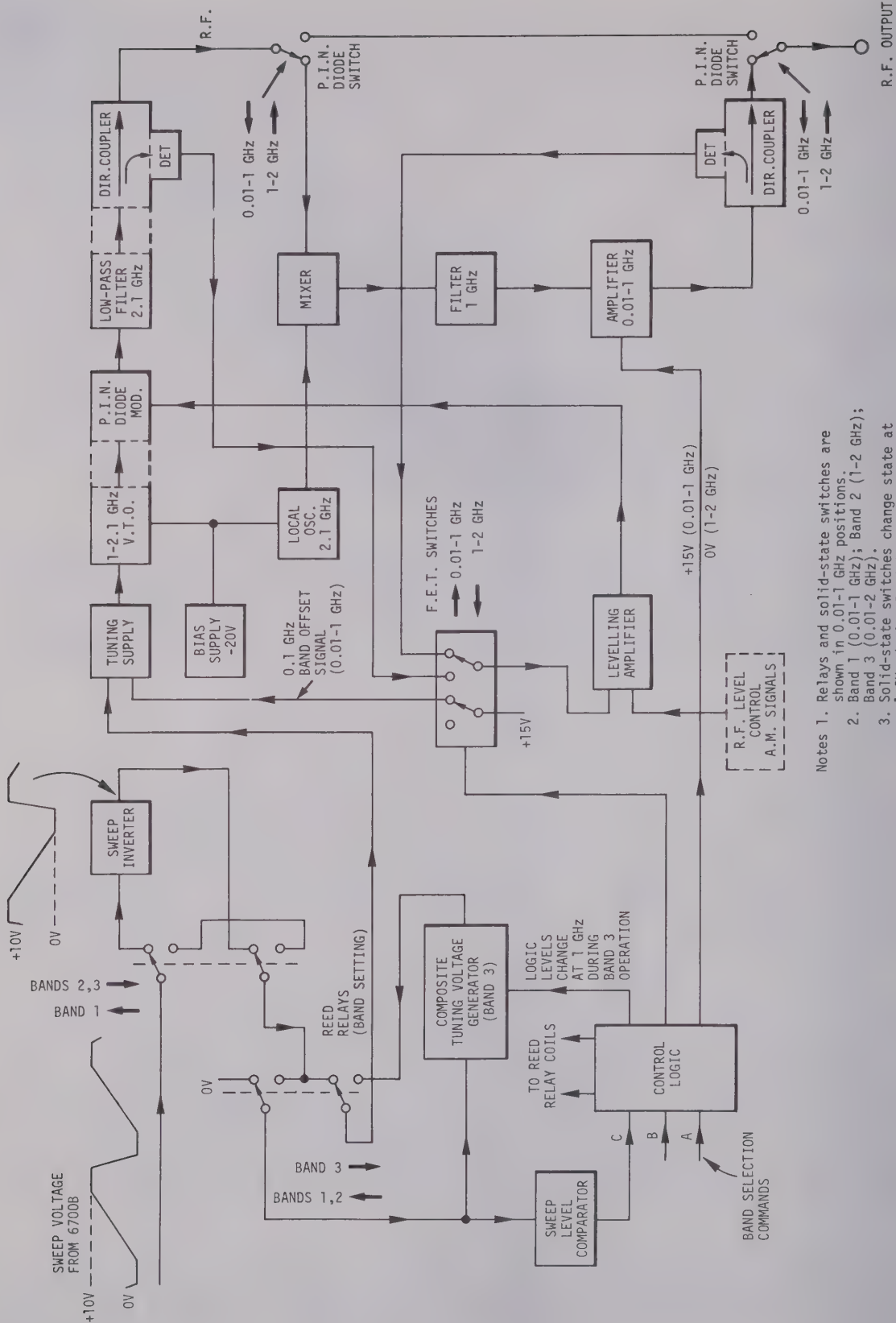


Fig. 2 Block diagram of r.f. unit type 6700B

9. When the control logic commands it, the solid-state switches are set so as to change the range to 1-2 GHz. The r.f. output from the 1-2 GHz directional detector is then connected directly to the output connector and the detected sample is switched to the input of the levelling amplifier.

CIRCUIT DESCRIPTIONS

10. The following sections describe the circuits and controls in the r.f. unit located on assemblies:-

A1	Leveller
A2	Tuning & bias supply
A3	Auxiliary
A4	Symmetrical sweep width
A11	Heat exchanger (used above 8 GHz only)

Tuning supply, YIG

11. The feedback amplifier used to control the current in the tuning coils of the YIG tuned oscillator is shown in Fig. 3. The circuit is configured as a current regulator. The voltage across the 'R sense' resistor is determined by the ratio of R105 to R29 and the amplitude of the input tuning voltage. The current that flows through the YIG tuning coil is then determined by V_0 and the parallel combination of R sense and R105. R sense is made considerably smaller than R105 and it dominates in setting the value of tuning coil current. The tuning coil current, therefore, is directly proportional to the input tuning voltage.

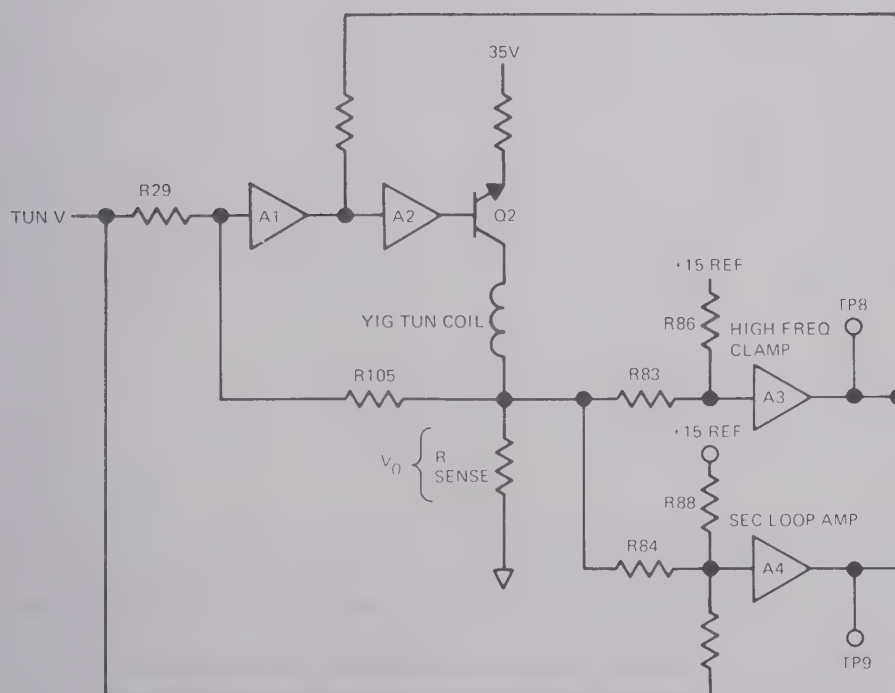


Fig. 3 Simplified circuit diagram of YIG tuning supply

12. Under certain circumstances, the effective value of the input tuning voltage could try to drive the YIG tuning coil current beyond its normal operating range, and cause the r.f. oscillator to switch to a different mode of oscillation. This would result in an erroneous r.f. output from the sweeper. To prevent this from happening, a high frequency clamp (Amp 3) circuit is used. The values of R83 and R86 are selected so that, when V_o exceeds a specified level, a signal appears at the output of Amp 3. At all other values of V_o , the output from Amp 3 is zero. In this way, when the YIG tuning coil current limit is exceeded, the main feedback loop is rendered ineffective by the feedback loop consisting of Amp 2, Q2 and Amp 3. This clamping feedback loop uses as its reference, the +15 V supply via R86 and its action is to maintain V_o constant, independent of the increased level of the input tuning voltage.

13. Dual feedback loop. When exceedingly fast waveforms are presented at the input of the YIG tuning supply, this high-gain, but relatively narrowband, feedback amplifier circuit introduces non-linearities caused by slew rate limitation in one or more of its stages. The resulting distortion in the output and the subsequent recovery time delay would present frequency shifts and calibration inaccuracies beyond the limit of the specification if no correction were applied.

14. To eliminate this type of distortion, a secondary loop amplifier (Amp 4) is used which functions in a manner not too dissimilar from the amplifier used in the high frequency clamp. It should first be pointed out that the slew rate limiting exists only in Amp 1. With this in mind, the input to Amp 4 is the difference between the input tuning voltage and the output V_o . When these two signals are in perfect synchronism, there is no output from Amp 4. When there is distortion, the output V_o does not follow the input and a net error signal appears at the input to Amp 4. The output of Amp 4 is fed to Amp 2 in the same way as the high frequency clamp circuit and thereby removes Amp 1 from the feedback loop. The new loop consisting of Amp 4, Amp 2 and Q2 takes control and causes the output V_o to keep pace with the input tuning voltage waveform. This secondary loop has a wider bandwidth (faster response) and responds with no slew rate distortion. It does, however, have a lower loop gain and would not be desirable for use when long term stability (drift) is important. This is taken care of automatically since the secondary loop is only active during the transient interval when the main loop cannot cope with the rapid change required of it. Once the fast waveform has passed, loop control is returned to the high gain, high stability main loop.

15. Sweep delay compensation. The frequency of a YIG tuned oscillator is tuned by changing the magnetic field in which the YIG material is located. The magnetic field is generated by an electromagnet driven by a current source.

16. Let us assume a perfect current driver; that is, one which will produce a current sawtooth in perfect synchronism with the sawtooth tuning voltage. We would expect the output r.f. frequency to be in perfect synchronism also. In fact, however, this is only true at slow sweep rates and is not realized at high sweep rates because of eddy (induced) currents in the magnetic material of the electromagnet. As the sweep speed is changed, the linear relationship between r.f. frequency and tuning coil current is distorted, and produces a frequency shift as seen on the displayed response. The effect is, therefore, most noticeable at high sweep speeds and is a particular problem in multiband systems where an entire octave must be swept in only a fraction of the time available for the full sweep.

17. Since this sweep delay distortion is not inside the closed loop of the YIG tuning supply, a compensation signal must be introduced and combined with the tuning voltage signal. The combination of these two signals comprises a distorted input which is time-sensitive and non-linear in proportions that result in a linear, and sweep-time-independent, relationship between the output frequency and the linear sawtooth sweep voltage.

18. The circuit used to provide the compensation signal is shown schematically in Fig. 4. The essential characteristic of the compensation signal can be seen in the waveform at TP6, there being a step component summed with a ramp component. The step is formed by differentiation of the input sawtooth and feeding the resulting step to TP6 via IC4B. The ramp component is generated by multiplying the d.c. restored tuning voltage sawtooth with the output of the differentiator. This signal is combined with the step in IC4B and the combined signal appears at TP6. As the sweep rate is varied, the value of the derivative changes. This results in an increase in step height and an increase in ramp slope with increase in sweep speed.

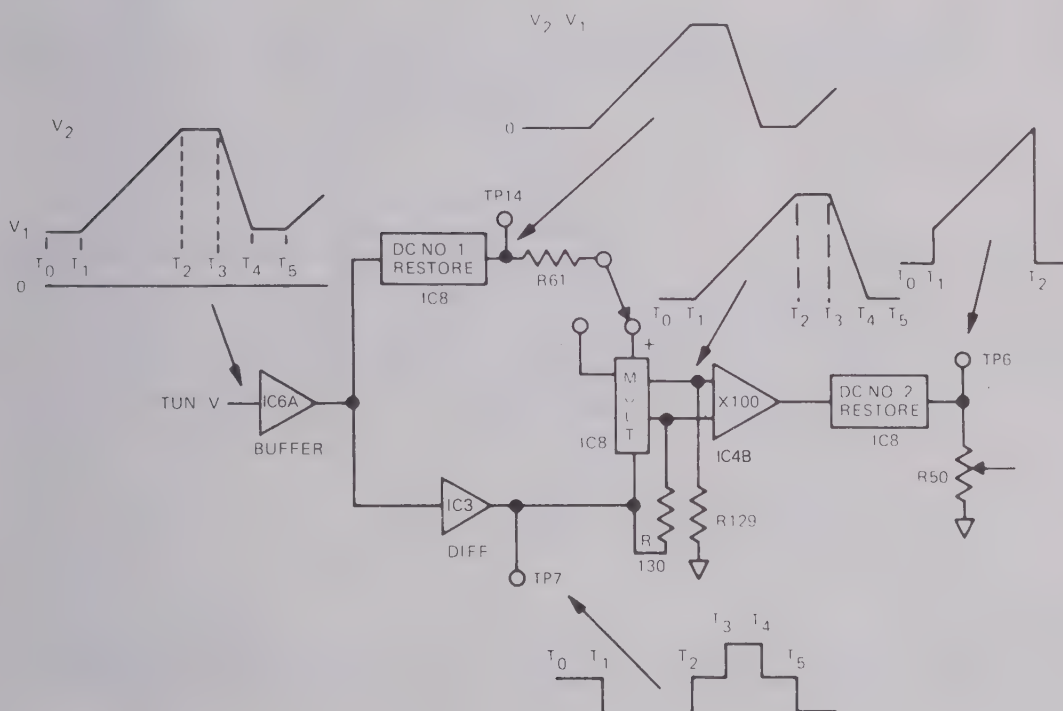


Fig. 4 Simplified circuit diagram of sweep delay compensation

19. To adjust the circuit for optimal compensation, R61 is selected to provide the correct ramp slope and R130 and R129 are selected to provide the correct step amplitude. R130 must always be equal to R129.

20. DC restorer circuits are used so that the sawtooth compensation signal can be set to 0 volts at the beginning of sweep independently of the d.c. level present in the input tuning voltage signal. The d.c. level at the input is a function of the setting of the F1 control. Typically, it is at some frequency other than the low end of the band. The compensation signal is combined with the tuning voltage signal at the input stage of the YIG tuning supply, Q8.

21. Automatic tuning supply bandwidth. In normal operation in the swept mode, and at maximum sweep speed, the full bandwidth of the tuning supply is required so that there is no undesired distortion of the linear sawtooth drive signal to the r.f. oscillator. At slower sweep speeds and in the c.w. mode, the bandwidth requirement is reduced because of the slow tuning waveform. If the bandwidth is reduced, the amplitude of the noise on the tuning signal will be reduced in proportion to square root of the bandwidth, and will thereby reduce the residual f.m. on the r.f. output frequency.

22. In the 6700A series of r.f. units, the tuning supply bandwidth is automatically controlled in accordance with the sweeping rate used by the operator. A simplified diagram of this circuit is shown in Fig. 5. The bandwidth is determined by R105 and the capacitance C29 or the parallel combination of C29 and C30. Bandwidth is maximal when Q16 is an open circuit and minimal when Q16 is a short circuit.

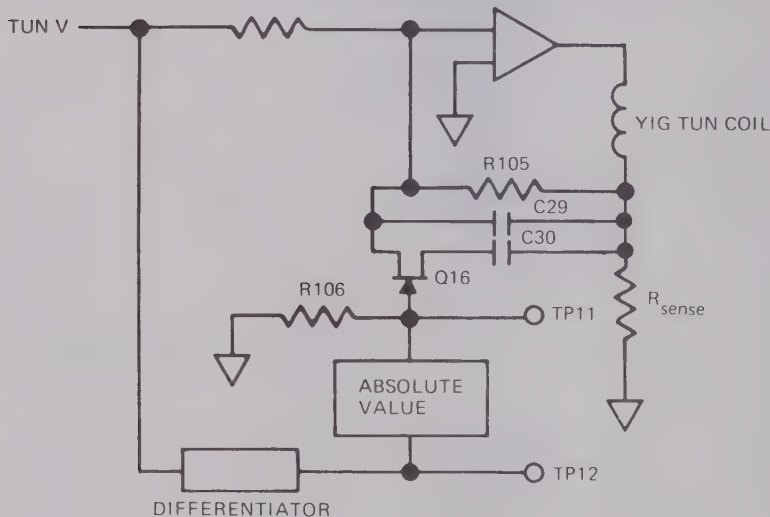


Fig. 5 Simplified circuit diagram of automatic tuning supply bandwidth

23. The state of Q16 is controlled by the absolute value generator circuit the input to which is the derivative of the tuning voltage. It can be seen, therefore, that at sufficiently high sweep rates, the derivative will be large enough to cause Q16 to open circuit and thereby increase the bandwidth of the tuning supply. The differentiator is shown in Fig. 6 where C27 and R97 determine the differentiating time constant. The zener diode CR35 is combined with the diode bridge circuit in the feedback path to limit the maximum positive or negative amplitude at the output of the differentiator.

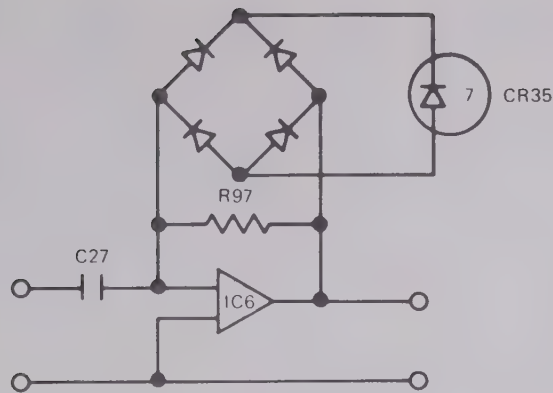
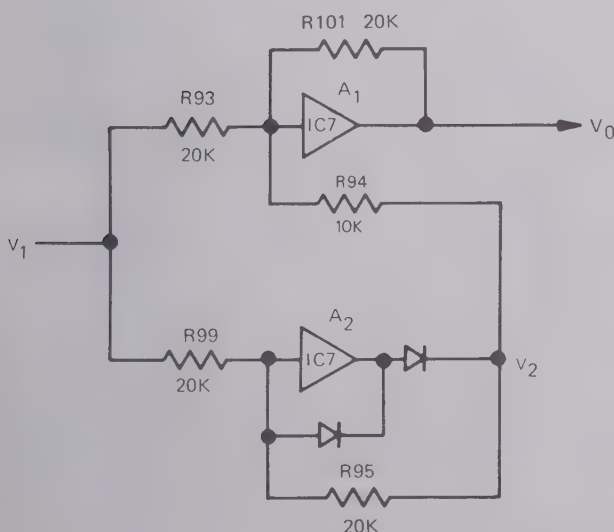


Fig. 6 Simplified circuit diagram of differentiator

24. The absolute value generator is shown in Fig. 7. Amplifier A1 is an operational summing amplifier providing the sum of two signals:

- (1) The input V_1 .
- (2) The output V_2 from amplifier A2.

The values of circuit resistance are such that, if V_1 is negative, the gain of A1 via R93 is twice the gain via R94 and the resulting output is equal to V_1 . When V_1 is positive, amplifier A2 is limited by virtue of the diodes in its output to 0 V. Hence, only A1 is operative and the output is equal to $-V_1$. Thus, the output is negative in both cases and of amplitude V_1 . In the practical circuit, R101 is 120 k Ω , so that the output is 6 V_1 .



If V_1 is negative,

$$V_0 = -V_1 - 2V_2$$

But $V_2 = -V_1$,

$$\therefore V_0 = V_1 \text{ (also negative)}$$

If V_1 is positive,

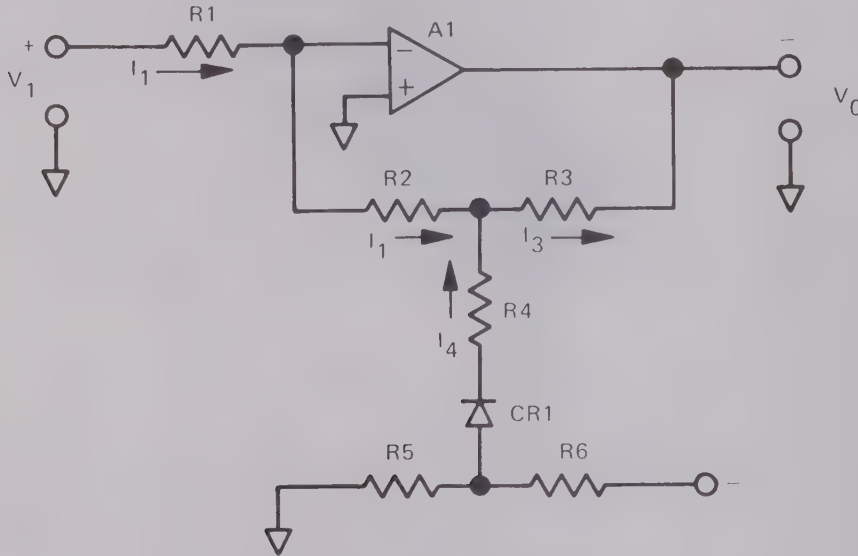
$$V_0 = -V_1 - 2V_2$$

But $V_2 = 0$

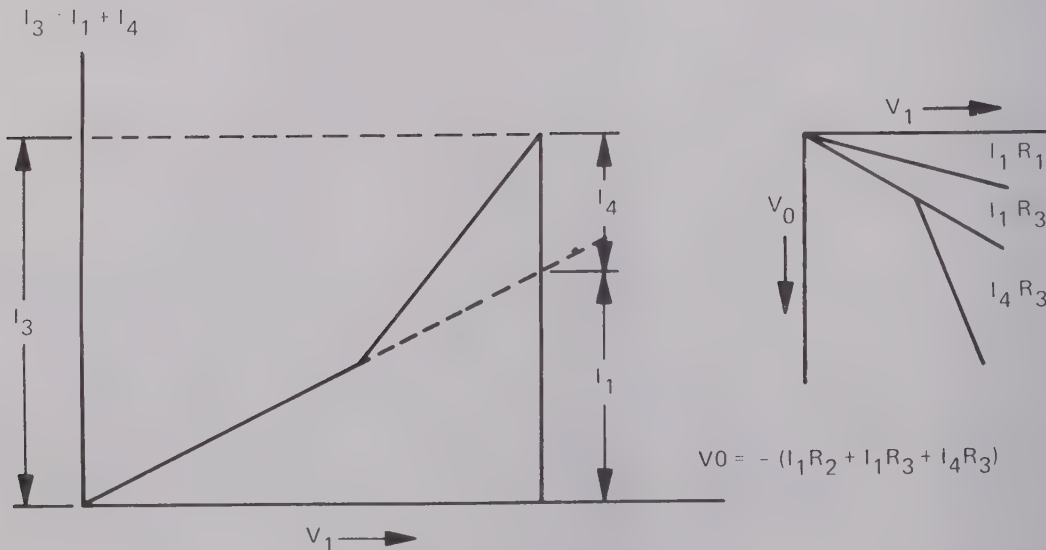
$$\therefore V_0 = -V_1$$

Fig. 7 Simplified circuit diagram of absolute value generator

25. Varactor tuning supply. The voltage vs. frequency curve for the varactor tuned oscillator is non-linear and it requires a "distorted" sawtooth drive in order to compensate and thereby provide a linear overall voltage vs. frequency relationship. The "distortion", or shaping, is done in the same operational amplifier used as the tuning supply. A simplified non-linear amplifier is shown in Fig. 8. A linear sawtooth signal, V_1 , at the input results in a linear current I_1 which also flows through R_2 . With the increase in I_1 the potential at the junction of R_2 and R_3 increases until $CR1$ is forward biased and conducts current I_4 . The current in R_3 is $I_3 = I_1 + I_4$ and output voltage $V_0 = -(I_1 R_2 + I_1 R_3 + I_4 R_3)$ as illustrated in Fig. 8B is non-linear.



(a) Circuit diagram



(b) Transfer characteristics

Fig. 8 Simplified non-linear amplifier

26. This technique is expanded with the use of many diodes and can provide an essentially smooth curvature in the output voltage characteristic. A more detailed circuit of the tuning supply is shown in Fig. 9. A high voltage pre-regulator is used and consists of a constant current generator, Q6 and CR38, driving Zener diode CR39. Transistor Q9 is used as an emitter follower to supply the current requirements of the output stage, Q5. In the actual circuit, additional transistor stages Q4, Q13 and Q19 are used to provide current and voltage limiting where signal transients would otherwise cause undesirable non-linear distortions.

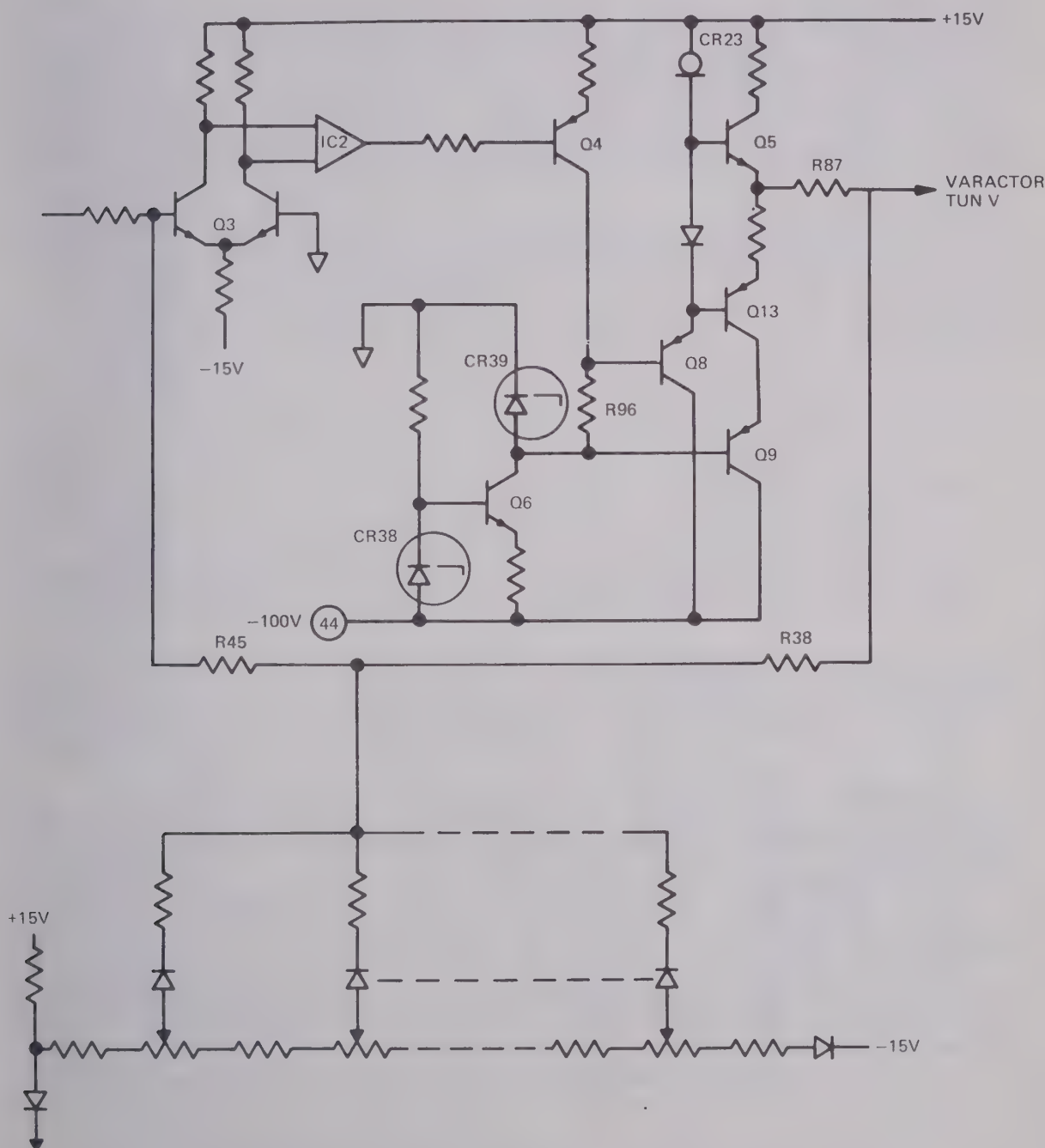


Fig. 9 Varactor tuning supply

Levelling circuit

27. The levelling circuit controls the amplitude of the r.f. output. In the levelled mode, the amplitude is maintained constant as the r.f. frequency is swept across the band. In the unlevelled mode, the normal variation in r.f. source amplitude will be present at the output. In the levelled mode, a feedback amplifier is used consisting of a high gain amplifier, r.f. diode modulator, directional coupler and r.f. detector. This circuit is shown as a simplified block diagram in Fig. 10.

28. The forward path consists of all the elements described above and the feedback path is via amplifier A1. It can be seen, therefore, that the function of the levelling amplifier is to maintain the voltage at the output of amplifier A1 constant and proportional to the reference r.f. level control setting. Since the transfer characteristic of amplifier A1 is constant and independent of r.f. frequency and r.f. amplitude, the output of the crystal detector also is kept constant and proportional to the reference r.f. level control setting.

29. If the transfer characteristics of the directional coupler and crystal detector are independent of r.f. frequency over the band of interest, then the loop will adjust the attenuation of the diode modulator so that the amplitude of r.f. output is constant as the r.f. frequency is swept across the band.

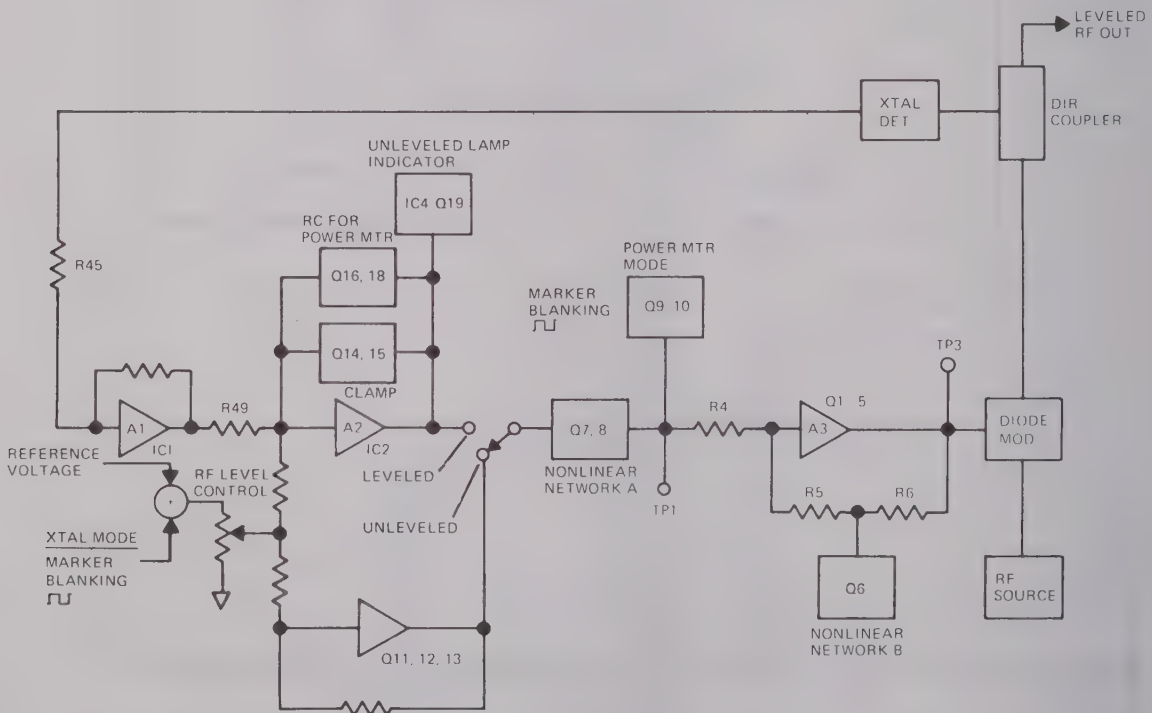


Fig. 10 Simplified block diagram of r.f. leveller

30. Linearized loop gain. Operation of the leveller described so far assumes that the loop is stable and that there are not excessive variations in forward loop gain. In normal use, however, the change in r.f. level control settings causes the r.f. output level to change over a sufficient dynamic range (in excess of 10 dB) that the square law characteristic of the crystal detector, and the non-linear transfer characteristic of the diode modulator, cause excessive variation in forward loop gain. This gain variation gives rise to the following dilemma.

31. If the closed loop bandwidth is optimized at high gain conditions in the loop to provide the desired rise-time for the leveller, it will be inadequate when the loop operates at low gain conditions. On the other hand, if the loop gain is increased so that adequate closed loop bandwidth is obtained at lower gain conditions, then when the loop operates at high gain conditions there will be excessive phase shift in the loop, resulting in overshoots, ringing or even loop oscillation. In the past, sweeper manufacturers provided a front panel "loop gain" control and required the operator to optimize the loop gain for the particular operating r.f. level. In this new leveller, a combination of non-linear networks is included to cancel the non-linearities of the diode modulator and crystal detector, and thereby provide uniform rise-time for all r.f. level settings with minimal overshoots or ringing on the output r.f. waveform.

32. The A2 amplifier contributes the most gain to the loop and as a result requires special care when the leveller is required to turn r.f. power on or off under the control of fast waveforms such as pulse modulation, blanking, etc. When the control signal directs the r.f. to be turned off, there is almost no signal returned from the crystal detector and the feedback loop is effectively opened. With this loss of control, the A2 amplifier would saturate and the capacitors used for phase shift stabilization would charge to the supply voltage. If, at this time, the control signal directed the r.f. to be turned on to a specified level, the loop would remain open until the charged capacitors discharged to their normal operating levels. This would cause a delay in the output r.f. turn-on waveform and also generate a recovery transient that would distort the output.

33. To overcome this problem, a clamp circuit consisting of Q14 and Q15 is biased so that they conduct when the output of IC2 exceeds the limits of ± 4 V. This controls the output swing of IC2 to a value that does not introduce any significant delay or transient distortion.

34. Power meter levelling. When the r.f. detector used for levelling is a power meter using a thermistor transducer, the stabilization of the levelling loop must be modified. The thermistor element has a slow response and thereby introduces excessive phase shift in the feedback loop resulting in loop oscillation. To avoid this, a stabilization network, shown in Fig. 11, consisting of C28 and R42, is introduced by switching Q18 on or off via Q16. With the modified loop stabilization, the response time of the closed loop is drastically increased to the order of *seconds*. This response time is perfectly compatible with the power meter which is essentially dictating the entire loop response. The operator must, however, be sure to limit the sweep time selector to the region between 10 and 100 s because the r.f. frequency sensitive variation will not be removed at higher sweep rates.

35. Level modulation by the r.f. markers, square-wave, and blanking waveforms from the circuits in the mainframe is introduced after the slow responding amplifier via Q9 and Q10. The response time of the levelling loop is too slow to follow the 1 kHz square-wave modulation and therefore it is the average power of the modulated waveform that is regulated. Since the duty factor is 50%, the peak power with square-wave modulation will be twice the average power. RF DURING RETRACE should be left ON for best results when using power meter levelling.

36. Gain control - power meter levelling. When the range setting on the power meter is changed, and for example assume it is reduced (lower power level), the levelling feedback loop operates to cause the needle on the power meter to remain stationary. The meter reading is equivalent to the signal output used to complete the feedback path and, therefore, the levelling loop must reduce the r.f. power into the power meter at the lower range setting. Under this circumstance, consider the effective transfer gain of the power meter. Since its output is constant with a reduction in input power, the gain of the power meter is increased. It can be seen, therefore, that the levelling loop gain is a function of range setting of the power meter. It is necessary to provide a gain control for the operator to optimize loop gain over the range of settings used on the power meter. This control is a front panel screwdriver adjustment R4 and is operative only in the power meter levelled mode.

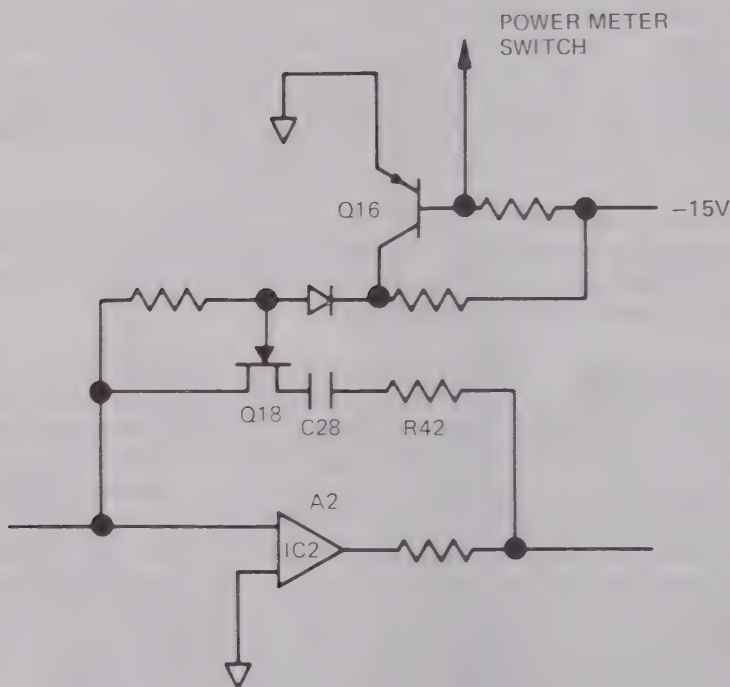


Fig. 11 Power meter levelling stabilization network

37. Auto-polarity circuit. The levelling circuit normally operates with a specific polarity at the output of the r.f. detector. In some equipments a switch is provided to adjust the circuit configuration when this polarity is changed. In the 6700A-series r.f. units, a circuit is included which automatically performs the switching described above when the polarity of the detector is changed. This means that, for either the "crystal" or the "power meter" mode, the levelling circuit will automatically adjust to the polarity used.

38. A simplified block diagram of the circuit that controls this operation is shown in Fig. 12. The input to A1 is controlled by a d.p.d.t. relay which changes the polarity of its gain. The output of A1 is sensed by a comparator circuit which produces a transition when the level at TP4 exceeds a specified value and polarity. This level is exceeded (+0.15 V) when the wrong polarity occurs at the input and the loop attempts to increase the r.f. output. The transition turns on both the multivibrator, which oscillates at a few cycles per second, and the gated flip-flop which is also driven by the multivibrator. The output of the flip-flop drives a binary relay driver.

39. One state of the multivibrator will set the relay contacts to a position which is correct and the output of A1 will go negative. This condition will remove the transition at the output of the comparator and the levelling loop will then operate normally. The multivibrator is switched off, but the gated flip-flop remains latched in the desired condition.

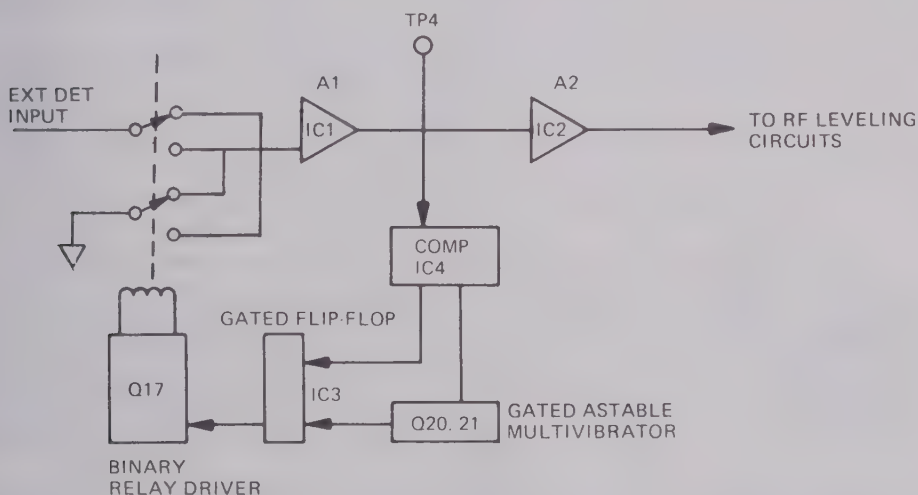


Fig. 12 Block diagram of auto-polarity circuit

40. Amplitude modulation. All control of the r.f. amplitude is done via the r.f. diode modulator and its control circuit, the leveller. In addition to any external a.m. input signals, the internally generated signals are combined in the levelling circuit to form one composite amplitude modulating waveform. These signals include: frequency markers, retrace blanking, square-wave and corrective levelling signals.

41. In the levelled mode, all of these signals are combined linearly in the operational amplifier that defines the levelling loop. If the reference crystal detector used in levelling is operated in its linear range, the output r.f. amplitude will be linearly modulated with the input a.m. signal. If the reference crystal detector is operated in its square law region, the output RF POWER will be linearly modulated.

Bias supply

42. The bias supply furnishes the power to the Gunn diode or transistor in the r.f. oscillator, as may be the case in a particular r.f. unit. A simplified circuit diagram is shown in Fig. 13. The supply shown here is a "positive output" configuration used in those r.f. units which require a positive voltage with respect to ground. When the circuit is required to supply a negative output voltage, the unregulated supply is connected in reverse and the transistors shown in Fig. 13 are all npn.

43. In some r.f. units, a heater supply is also required where the heater voltage is higher than the bias voltage. This dual supply is obtained from terminals W and V. The regulator operates to control the potential at terminal V, and the Zener diode CR47 provides a sufficiently accurate and stable voltage increase above the bias voltage to meet the requirements of the heater.

44. The regulator is a typical operational amplifier configuration with R8 being the feedback resistor and the series combination of R9 and R19 being the input resistor. The amplifier gain is the cascade combination of IC1 and Q1 (located on a heat-sink at the rear of the r.f. unit).

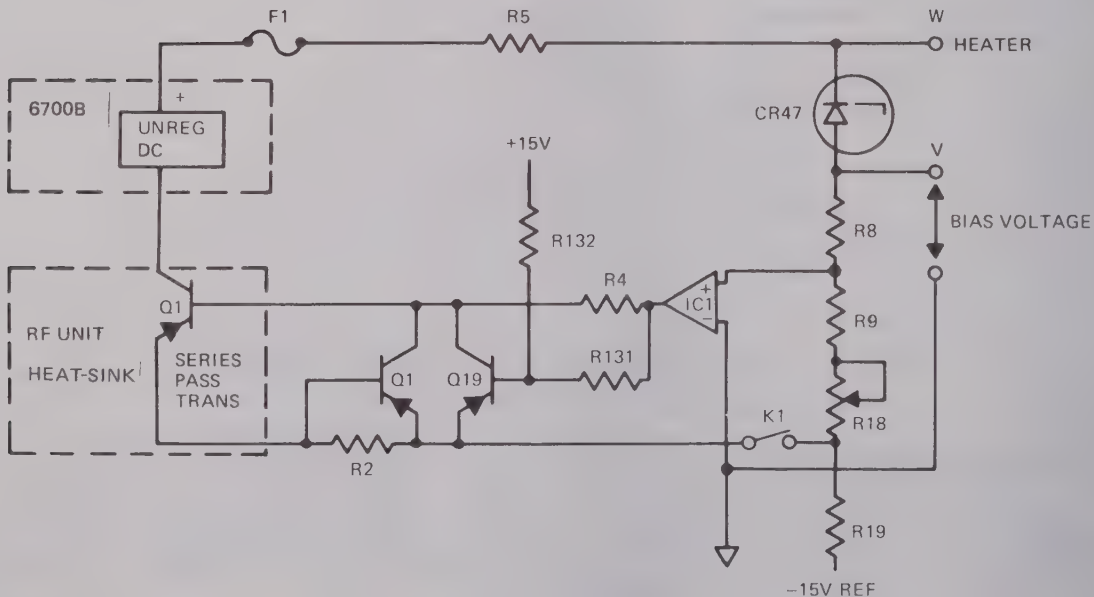


Fig. 13 Simplified circuit diagram of bias supply

45. Protective circuits. To prevent damage to the r.f. oscillator source, a number of protective circuits have been included in the design of the bias supply.
46. Inhibiting delay. When the a.c. power is first applied, as during a normal equipment turn-on, the sequence of turn-on for the + and -15 V supplies is uncontrolled. As a result, the output of the bias supply could overshoot the desired value during the time interval between power on and stabilization of the + and -15 V supplies.
47. To prevent overshoot, Q19 is wired in shunt with the drive to the output series regulator. In normal operation, the output of IC1 is negative and Q19 is biased off causing it to have no effect on the operation of the bias supply. Assume that the +15 V supply is on before the 15 V supply reaches its final value. Under this circumstance, the output of IC1 will be positive and keep the output series regulator cut off and the output of the bias supply will be zero. If we next assume that the -15 V supply is on before the +15 V supply, Q19 will be biased "on" via R13 causing any drive current to the output series regulator to be shunted through Q19 and the output of the bias supply will again be zero. As the lagging +15 V supply reaches its normal level, current through R132 raises the base potential of Q19 until it becomes cut off, the bias supply rising smoothly to its normal level with no overshoot.
48. Bias tracking. Certain oscillators require a bias voltage which varies with frequency. This topic is discussed in detail in Supplement 1 at the rear of this manual.
49. Current limiting. The current limiting circuit consists of transistor Q1 and resistor R2. If the bias supply load current tries to exceed a prescribed level, the voltage drop across R2 increases in a direction which causes transistor Q1 to conduct, thereby shunting the drive current to the series pass transistor. This action causes the output bias supply voltage to drop to a level that will maintain the load current constant and equal to the level set by the selection of the value of R2.
50. In the actual circuit, a feedback network is applied to the current limit transistor Q1 via R1 and R3 to generate a foldback characteristic that will cause the load current to stabilize at a lower value after the current limiting circuit has been actuated. This feature reduces the power dissipated in the series pass transistor if the output of the bias supply remains short-circuited for an indefinite period of time.
51. Fuse. If circuit components of the current limiting circuit should fail, and an increase in load current occurs, fuse F1 will blow and thereby protect the r.f. source.
52. Crowbar circuit. The crowbar circuit is illustrated in Fig. 14. Its purpose is to provide protection to the r.f. source in the event that the bias supply voltage exceeds a safe level. In operation, the SCR, CR7, is fired and produces a short circuit across the bias supply, thereby reducing the bias voltage to zero. A reference voltage developed by Zener diode CR6 is compared with a sample of the output of the bias supply in transistor Q3. As the bias supply voltage increases, the base of Q3 becomes more negative until it causes Q3 to conduct, at which point CR7 is fired. The critical level at the base of Q3 is set by the value of R10.

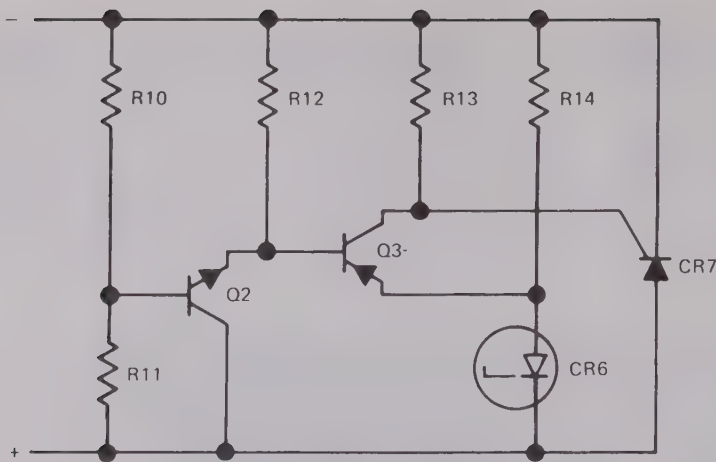


Fig. 14 Crowbar circuit

FM input circuitry for YIG-tuned r.f. source

53. The method for providing a direct-coupled wideband f.m. input is shown in Fig. 15. The input signal is frequency multiplexed via a high pass and low pass filter which, in turn, feed the modulation signal frequency components to the f.m. coil and the main tuning coil, respectively.

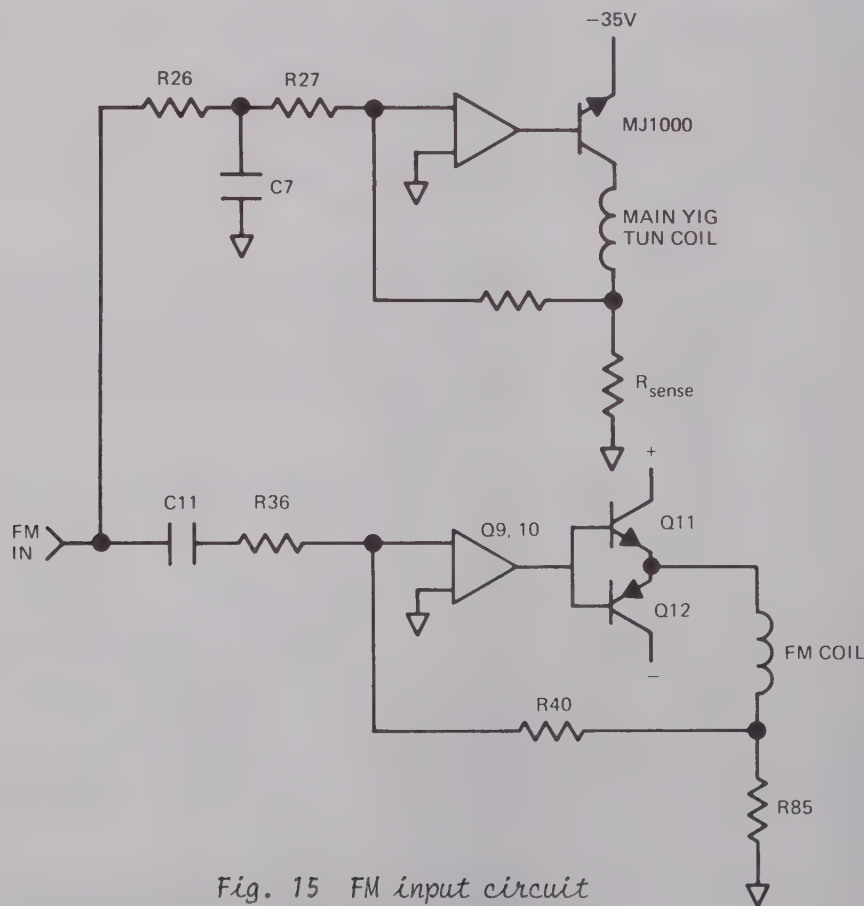


Fig. 15 FM input circuit

54. The f.m. coil is a special winding in the YIG tuning structure which has an air core and operates at high frequencies. The air core has lower "core loss" at higher frequencies and thereby provides wideband performance. The lower permeability of air compared with the iron core reduces the flux density for a given magnetizing current, and for this reason the f.m. coil cannot produce large frequency deviations.

Heat exchanger

55. In the higher frequency YIG tuned r.f. sources, the tuning current (and consequently the power required for tuning this source) is quite high (i.e., 30 - 50 W). To avoid dissipating too much power in one series pass transistor and causing intensive heat dissipation in one location, some of the tuning current is supplied by Q2 as shown in Fig. 16. Transistor Q2 is the heat exchange sink and is located as far away from the series pass transistor as is practical. In operation most of the current required at the low end of the tuning range is supplied by Q2, and as more current is required with increasing r.f. frequency, it is furnished via the series pass transistor.

56. The Transistor Q1 is used to control the heat exchange circuit and shut it off when the r.f. unit is in standby in multiband operation. The control signal is the presence or absence of the -15 V supply to R1.

Remote tuning

57. The remote tuning input signal is summed algebraically via R28 with all other tuning signals in an operational amplifier called the tuning supply. These inputs are always active and the user must, therefore, be sure that the other controls are set in their appropriate positions either to combine with the remote signal or not to interfere with it.

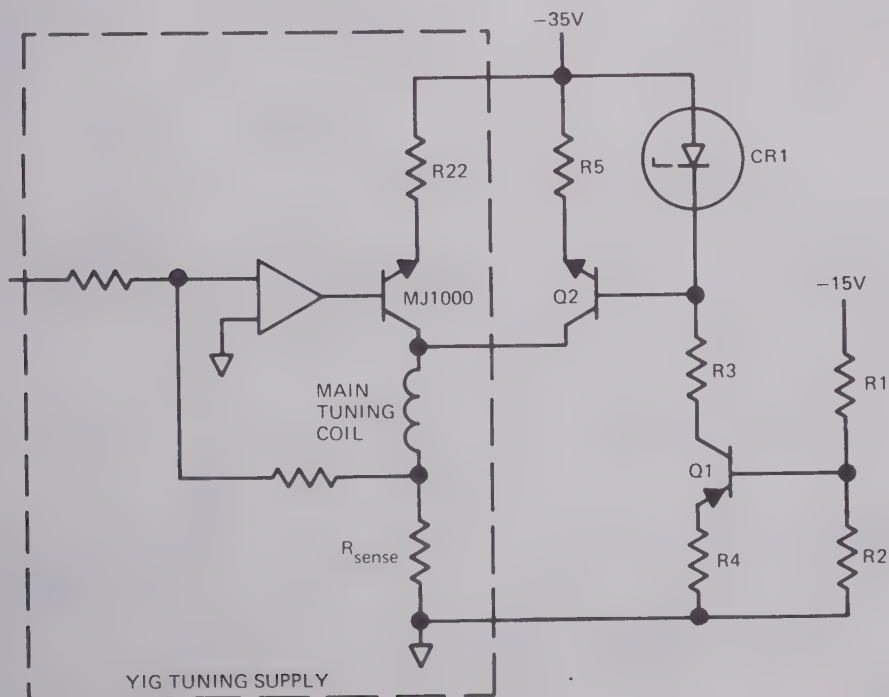


Fig. 16 Heat exchanger circuit

58. For exclusive control of the tuning supply by the remote tuning signal, the mainframe controls should be set as follows:

Control	Setting
SWEEP FUNCTION	EXT/M1
M1	Fully anti-clockwise

Remote ON/OFF

59. The remote on/off function is intended to reduce the r.f. output to absolute zero without adjusting any other controls or removal of a.c. line power. This is done by reducing the bias supply voltage to zero. A relay controlled switch, K1, is used to set the reference for the bias supply to zero, as shown in Fig. 13.

Heterodyne unit control logic (6790A only)

60. The two basic frequency ranges of the 6790A r.f. unit can be used either singly or in an automatically multiplexed mode in which each sweep cycle covers 10 MHz to 2 GHz with only a momentary pause at the 1 GHz changeover point. This mode is referred to as the WB (wide-band) mode. A block diagram of the control logic for this system is shown in Fig. 17.

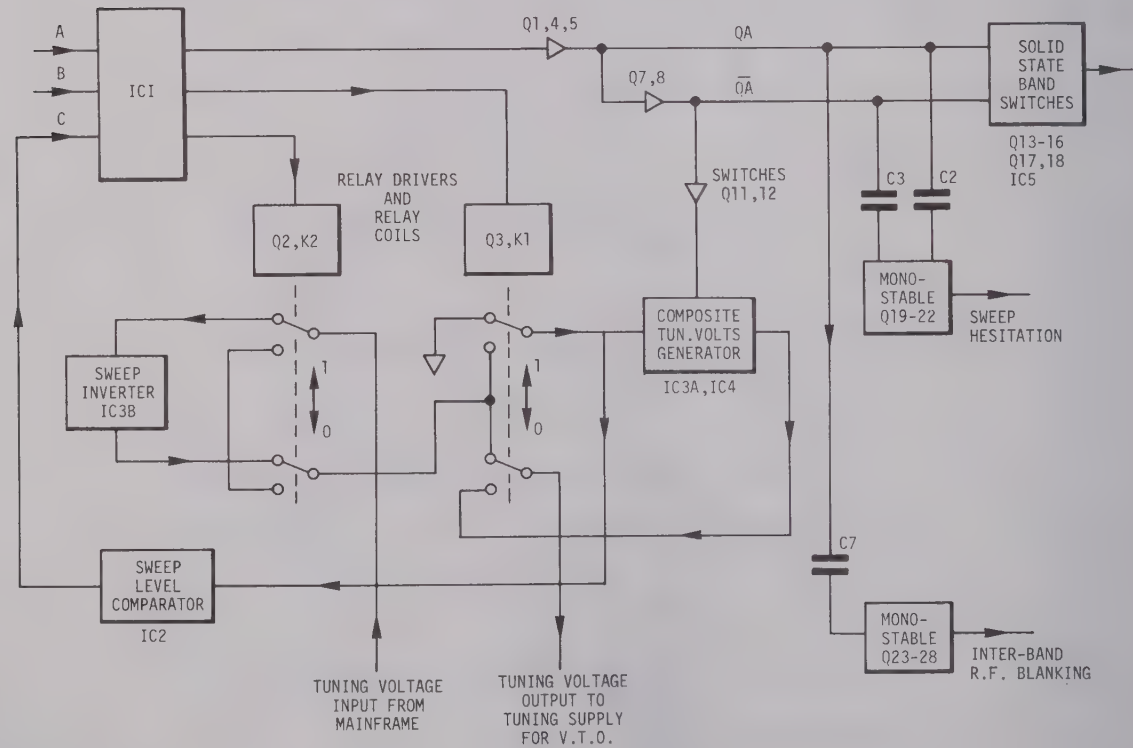


Fig. 17 Block diagram of control logic for 6790A

61. IC1, a triple 3-input NAND gate, provides the logic shown in Table 1.

TABLE 1 CONTROL LOGIC FOR 6970A

Band selection lever switch	Inputs			Outputs		
	A	B	C	$\overline{Q_A}$	K1	K2
0.01 - 1 GHz	0	1	1	-5V	1	1
1 - 2 GHz	1	0	1	+5V	1	0
WB (0.01 - 2 GHz)	1	1	1 0	-5V +5V	0	0
Remote						
0.01-1 GHz (J1-C grounded)	0	1	1	-5V	1	1
1 - 2 GHz (J1-D grounded)	1	0	1	+5V	1	0
WB (J1-C,D open)	1	1	1 0	-5V +5V	0	0

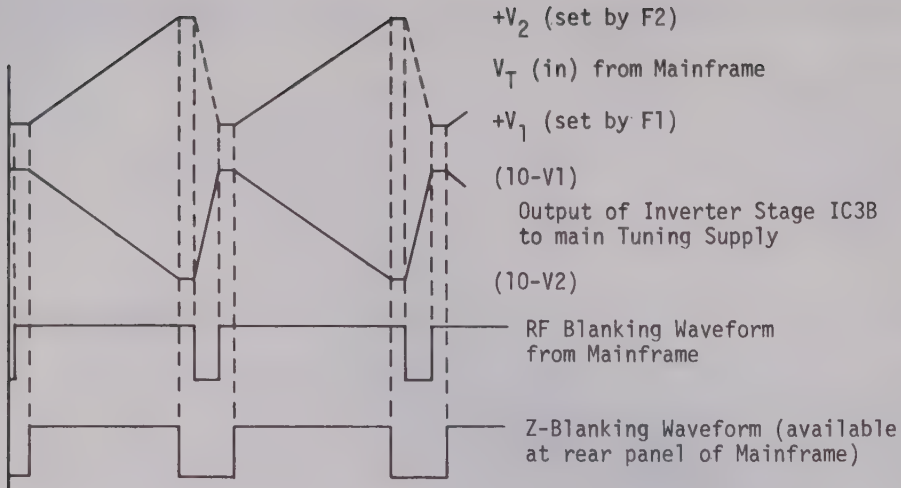
Notes... $\overline{Q_A}$ is -5 V when $\overline{Q_A}$ is +5 V and vice versa
Input '0' = ground potential
Input '1' = open circuit or +5 V
Relay state '0' = not energized
Relay state '1' = energized
A, B are inputs from band selector switch
C is logic level at output of comparator.

62. The combination of signals that results in K1 = K2 = 1 pulls in both relays K1 and K2, setting the comparator input to ground and routing the tuning voltage V_T (in) signal via IC3B which inverts and shifts it. This causes the varactor tuned oscillator (v.t.o.) to tune down in frequency as described in para. 6. The Q_A and $\overline{Q_A}$ signals position the band switches as described in para. 6 and the block diagram in Fig. 2. The signal combination resulting in K1 = 1 and K2 = 0 routes V_T (in) directly to V_T (out). Q_A and $\overline{Q_A}$ set the bandswitches for the 1 - 2 GHz band.

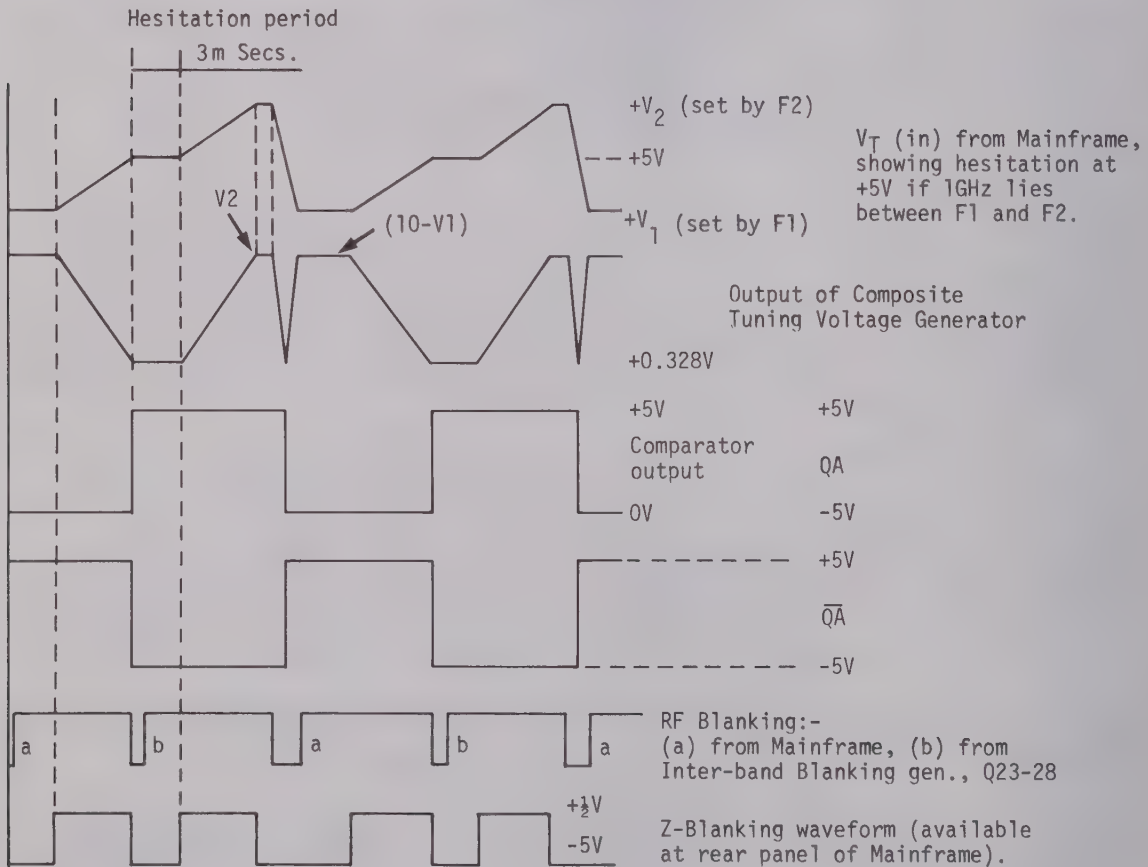
63. When the wide band or multiplexed sweep is selected, either by means of front panel band switch S2 or via the remote signals, we have K1 = K2 = 0. This condition routes V_T (in) to the inputs of comparator IC2 and the composite tuning voltage generator IC3A, IC4. The Q_A signal is now the complement of C, the output of the comparator circuit. Hence when the output of the comparator is at logic '1' the 0.01 - 1 GHz band is selected, and when it changes state to logic '0' the 1 - 2 GHz band is selected.

64. The composite tuning voltage generator is keyed by the $\overline{Q_A}$ signal to generate a waveform suitable to tune the v.t.o. so that the r.f. frequency corresponds to the multiplexed display sweep output voltage.

65. As the comparator output changes state, many circuit functions are triggered simultaneously. In order to prevent transients from being displayed and to allow the circuits of associated instruments (e.g. network analysers) to recover lock, the sweep is stopped for a period of approximately 3 ms and the r.f. output is blanked for 1 ms. The dwell-time and Z-blanking processor in the 6700B mainframe provides a -5 V signal for the duration of the hesitation period to suppress the display of a network analyser of the type which is not equipped with automatic blanking circuitry.



(a) Waveforms in 0.01-1 GHz operation



(b) Waveforms in 0.01-2 GHz operation with automatic band change at 1GHz.

Fig. 18 Tuning and blanking waveforms for 6790A

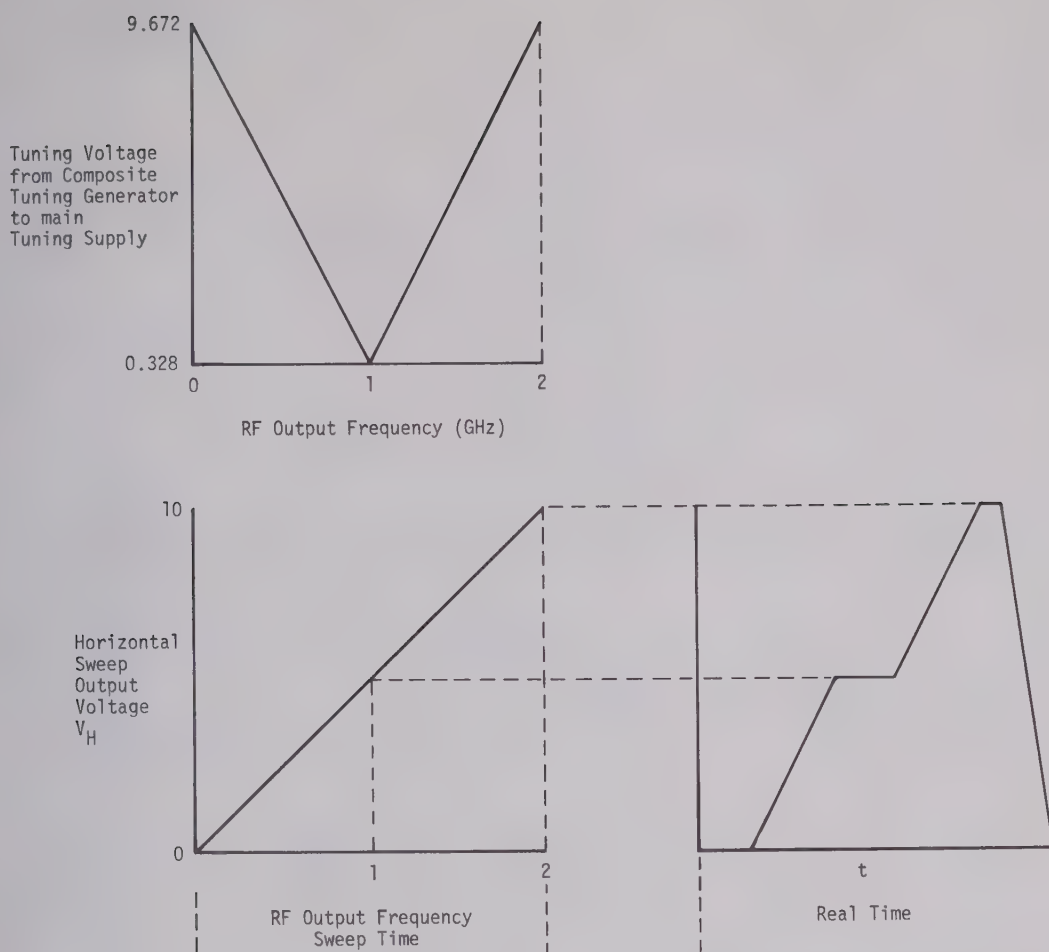


Fig. 19 Functional relationships

Tuning waveforms

66. The tuning voltage generator of the mainframe begins its cycle and proceeds normally until the comparator in the 6790A changes state. This triggers the sweep hesitation and interband blanking monostables. The sweep hesitation signal interrupts the tuning voltage generator and stops the sweep. The relationships between the various signals are combined in Figs. 18 and 19 showing how time, horizontal sweep voltage, V_T (out) to the A2 tuning and bias supply assembly, and r.f. output frequency are synchronized.

67. The comparator circuit is shown in simplified form in Fig. 20. When V_T (in) is zero, the net signal to the amplifier input is negative and the high gain of the amplifier causes it to saturate with a positive output. As V_T (in) increases a point will be reached, depending on the setting of R17, when the net signal to the amplifier reaches zero and goes positive. At this point the amplifier output will saturate with negative polarity.

68. The exact value of V_T (in) at which this transition takes place is controlled by the setting of R17 and the speed of the transition is a function of the gain of the amplifier.

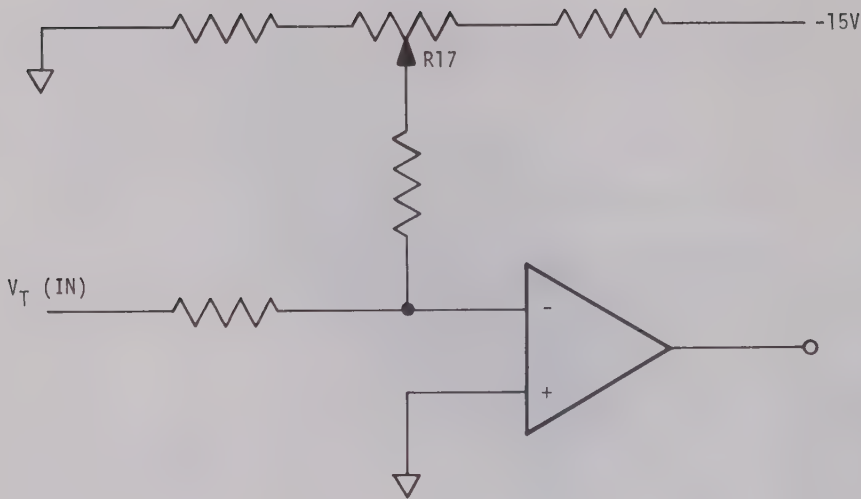


Fig. 20 Comparator circuit (simplified)

Composite tuning voltage generator

69. The V_T (out) signal is generated by the circuit shown in Fig. 21. During the first half of the sweep Q12 is turned on by $\bar{Q}_A$, such that the input of A2 receives a sufficiently negative signal to saturate it with a positive output. A3 hence tries to saturate with negative output but, due to D8 and D9, its output remains at zero.

70. Meanwhile, the $\bar{Q}_A$ signal turns Q11 off. A1 thus receives the V_T (in) signal and a bias signal via R24, R25. A1 inverts and shifts V_T (in) such that as V_T (in) varies from 0 to 5 V, V_T (out) varies from 10 V to zero.

71. When the comparator changes state $\bar{Q}_A$ gates Q11 and Q12 such that the output of A1 returns to zero. A2 inverts, amplifies and shifts V_T (in) and A2 re-inverts the signal. The output of A2 thus varies from 0 to 10 V as the input V_T (in) varies from +5 V to +10 V. The resultant V_T (out) signal is shown in Fig. 18 (b).

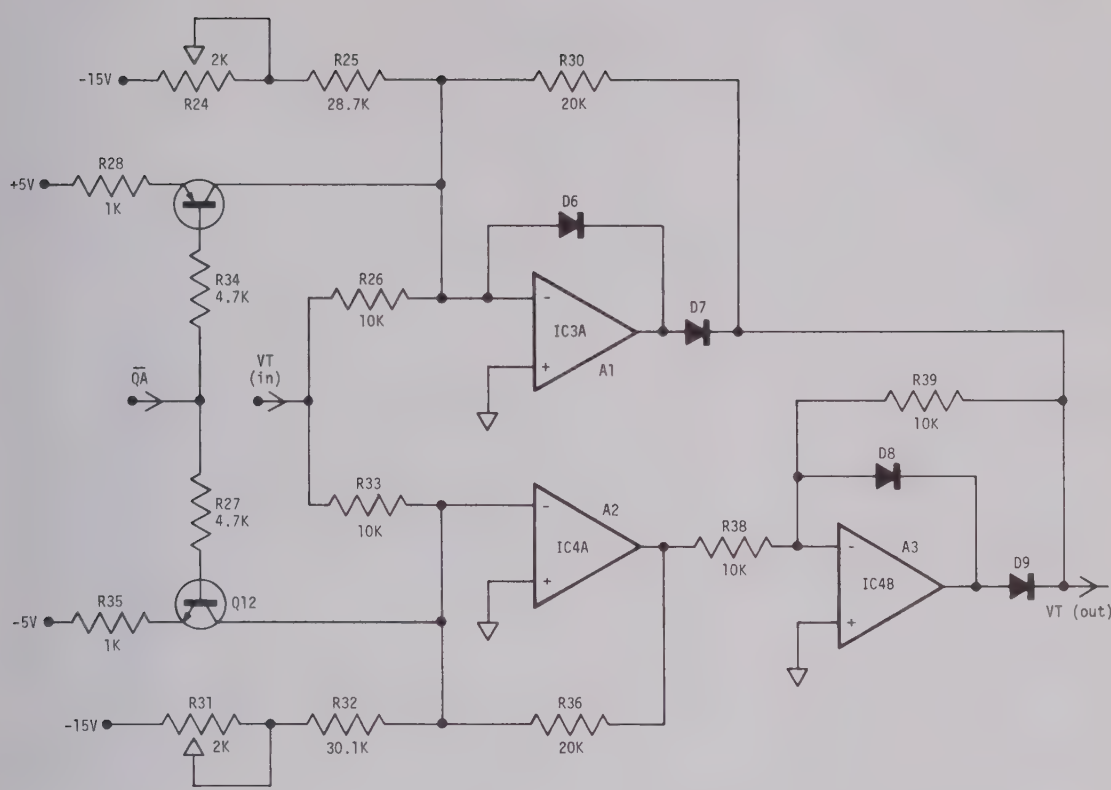


Fig. 21 Composite tuning voltage generator

Chapter 5

MAINTENANCE

CONTENTS

Para.

- 1 Introduction
- 2 Test equipment required
- 3 Performance tests
- 4 Frequency accuracy
- 5 Spurious signals
- 6 Frequency stability
- 12 Power variation (levelled)
- 15 Internal square wave
- 18 Symmetrical sweep width accuracy
- 19 Residual f.m.
- 20 Proportional sweep amplitude
- 21 Calibration procedure
- 22 Bias supply
- 24 Crowbar
- 25 YIG tuning supply
- 30 Varactor tuning supply
- 33 Control logic
- 34 Additional frequency calibration
- 35 Leveller

Table

	Page
1 Test equipment required for performance tests	3
2 Test equipment required for calibration procedures	3
3 Bias supply short circuit specification	16

Fig.

	Page
1 Frequency accuracy measurement test set-up	4
2 ΔF vs. 10 dB change in r.f. level test set-up	5
3 ΔF vs. 3:1 load v.s.w.r. test set-up	6
4 ΔF vs. $\pm 10\%$ line change test set-up	7
5 Frequency modulation test set-up	7
6 External levelling measurement test set-up (1)	9
7 External levelling measurement test set-up (2)	10
8 Spectrum analyser display	13
9 Test point maps	17
10 RF source - terminal location	19
11 Oscilloscope display, offset	23
12 Oscilloscope display, ramp	23
13 Oscilloscope display, tracking	23
14 Primary loop calibration test set-up	25
15 High frequency clamp calibration test set-up	25
16 Typical frequency error plot for varactor tuned r.f. unit	27
17 Major tuning supply maintenance ramp voltage waveform	28
18 Levelling calibration test set-up	32

INTRODUCTION

1. This section provides the information required to maintain and service the r.f. units for the type 6700B Sweep Oscillator and contains a list of the test equipment required, a performance check, and calibration and alignment procedures.

TEST EQUIPMENT REQUIRED

2. Test equipment other than those listed in Table 1 may be used if their specifications equal or exceed the required characteristics. The equipment required to perform the calibration is listed in Table 2.

PERFORMANCE TESTS

3. The following performance tests are carried out to verify whether the r.f. unit is operating within its specifications as listed in Table 1. The tests should be used as part of the incoming quality control inspection, as a periodic operational check, or after maintenance and service has been performed. The performance tests are, of course, for an r.f. unit installed in a fully calibrated 6700B mainframe.

Frequency accuracy

4. (1) Connect equipment as shown in Fig. 1.

(2) Set mainframe controls as follows:

Front panel

TRIGGER	LINE
MARKER AMPLITUDE	Clockwise
SWEeper FUNCTION	F1 - F2
SWEEP TIME (SEC)	.1
F1	Low Limit
F2	High Limit
1 kHz ☐	Off (down)
Line supply	On (up)

Rear panel

SWEEP RESPONSE TIME	AUTO
RF MARKERS	ON

RF unit

RF	ON
If the r.f. unit has Option-01 (internal levelling) set:	
LEVELLER MODE	INT (depress)
RF LEVEL	Adjust fully clockwise, then anti-clockwise until levelling is obtained across the entire band.

TABLE 1 TEST EQUIPMENT REQUIRED FOR PERFORMANCE TESTS

<i>Title</i>	<i>Requirements</i>	<i>Suggested manufacturer and model No.</i>
Variable transformer	at least 105 to 250 V a.c. 1 A	Zenith "Variac", V3 - G2
AC voltmeter	at least 105 to 250 V a.c. $\pm 2\frac{1}{2}\%$, 48 - 62 Hz	Salford Electrical, Selectest - Super 50
Oscilloscope	Vertical: d.c. to at least 300 kHz	Tektronix 561A with 2A63 Differential Amp 1 and 2B67 Time Base
Frequency meter, reaction type		
1 - 4 GHz	$\pm 0.1\%$ accuracy	Hewlett Packard 536A
2.6 - 8.2 GHz	$\pm 0.1\%$ accuracy	MI/Sanders 6049/1
5.3 - 18 GHz	$\pm 0.1\%$ accuracy	MI/Sanders 6049/2
Frequency counter	10 MHz - 2.1 GHz	EIP 350C
10 dB attenuator pad	Calibrated within ± 0.1 dB	MI/Sanders 6534/3
RF power meter with thermistor mount		
0.01 - 18 GHz	± 0.3 dB	HP 432A with HP 8478B
Directional coupler,	10 dB coupling factor	
30 to 1000 MHz	20 dB directivity	Anzac DCG10
1 - 2 GHz	22 dB directivity	MI/Sanders 6171/10
2 - 4 GHz	22 dB directivity	MI/Sanders 6173/10
4 - 8 GHz	18 dB directivity	MI/Sanders 6175/10
7 - 12.4 GHz	18 dB directivity	MI/Sanders 6177/10
12.4 - 18 GHz	15 dB directivity	MI/Sanders 6179/10
Adjustable length of coaxial line	30 mm travel	
Short circuit		
Crystal detectors	10 MHz - 18 GHz	MI/Sanders 6160
Spectrum analyser		HP 8555A
Pulse generator	± 10 V less than 1 μ s rise time, 10 to 1000 Hz	Lyons Instruments PG 25
Ohmmeter	DC continuity	Salford Electrical, Selectest - Super 50

TABLE 2 TEST EQUIPMENT REQUIRED FOR CALIBRATION PROCEDURES

<i>Title</i>	<i>Requirements</i>	<i>Suggested manufacturer and model No.</i>
Digital voltmeter	$\pm 0.01\%$ accuracy, 400 k Ω minimum resistance 1 mV sensitivity	Dana series 4600

If the r.f. unit does not have

Option-01 set:

LEVELLER MODE

OFF (depress)

RF LEVEL

Fully clockwise

- (3) Set the M1 and M2 indicators at the frequencies to be checked and adjust the MARKER AMPLITUDE as desired.
- (4) Tune the frequency meter to make its dip coincident with each marker dip.
- (5) Observe that the frequency indicator and the frequency meter indications fall within frequency accuracy limits of the r.f. unit specifications.
- (6) In the case of r.f. unit type 6790A, the lower frequencies in the 0.01-1 GHz and 0.01-2 GHz ranges are best checked in the CW mode using a digital frequency counter owing to the non-availability of suitable reaction-type frequency meters.

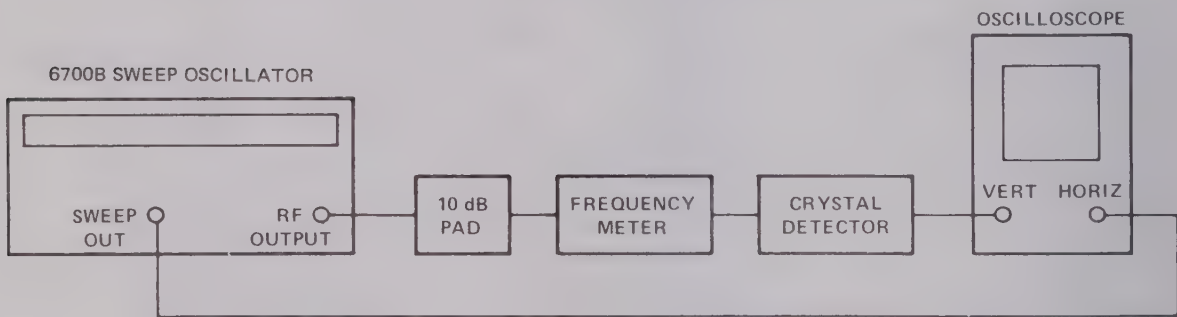


Fig. 1 Frequency accuracy measurement test set-up

Spurious signals

5. (1) Connect the RF OUTPUT to the spectrum analyser input. A 10 dB attenuator pad should be used to avoid burn-out of the spectrum analyser input.
- (2) Set the SWEEP OSCILLATOR controls as follows:

M1	Midband (or any specific frequency to be investigated)
SWEEP FUNCTION	CW M1
1 kHz ☐	Off (down)
RF LEVEL	Fully clockwise except for type 6790A which should be set to 20 mW output.

- (3) Observe the amplitude at the desired r.f. frequency, and at any spurious and harmonic frequency of interest. Follow the manufacturer's directions to distinguish spurious responses of the analyser from those of the SWEEP OSCILLATOR.

- (4) The unwanted responses should confirm with Table 1, Chap. 1.

Frequency stability

6. Stability tests should be conducted in a temperature-stable location, free from draughts.

Equipment warm-up of at least 15 minutes should be allowed prior to measurements.

7. ΔF vs. 10 dB change in r.f. level

- (1) Connect the equipment as shown in Fig. 2. A high resolution frequency meter may be substituted for the spectrum analyser.

- (2) Set type 6700B controls as follows:

M1	Midband (or any specific frequency to be investigated)
SWEEP FUNCTION	CW M1
1 kHz ☐	Off (down)
RF LEVEL	Fully clockwise
LEVELLER MODE	INT or OFF

- (3) Observe the power meter reading in dB, and the r.f. frequency indication. Reduce the power by 10 dB via the RF LEVEL control.
- (4) Note the change in frequency indication. It should not exceed the specification of the unit as given in Table 1, Chap. 1.

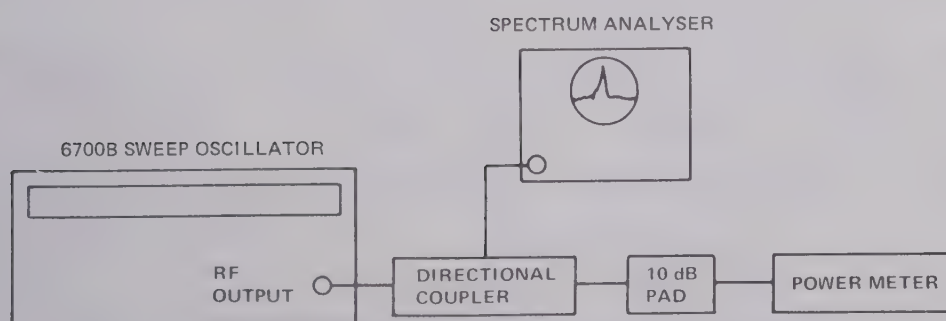


Fig. 2 ΔF vs. 10 dB change in r.f. level test set-up

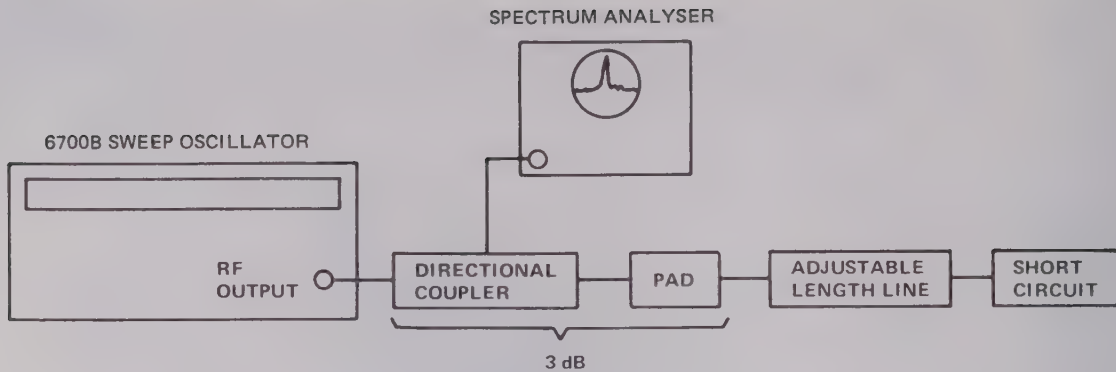


Fig. 3 ΔF vs. 3:1 load v.s.w.r. test set-up

8. ΔF vs. 3:1 load v.s.w.r.

- (1) Connect the equipment as shown in Fig. 3.

Note...

The combined insertion loss of the coupler and pad in the main line is to be 3 dB. Thus a 3 dB coupler and no pad or a 10 dB coupler and a 2.5 dB pad are suitable combinations.

- (2) Set the SWEEP OSCILLATOR controls as described in para.7.
- (3) Observe the peak-to-peak change in frequency indication as the adjustable length line is varied over at least a $\frac{1}{2}$ wavelength. Divide by two to get peak ΔF .
- (4) The maximum deviation should be within the specification as indicated in Table 1, Chap. 1.

9. ΔF vs. $\pm 10\%$ line voltage change

- (1) Connect equipment as shown in Fig. 4.
- (2) Set type 6700B controls as described in para.7.
- (3) Adjust the a.c. line input over the range 210 to 250 V r.m.s. (or 105 to 125 if applicable). Note the peak-to-peak change in frequency indication. Divide by two.
- (4) The maximum allowable result is given in Table 1, Chap. 1.

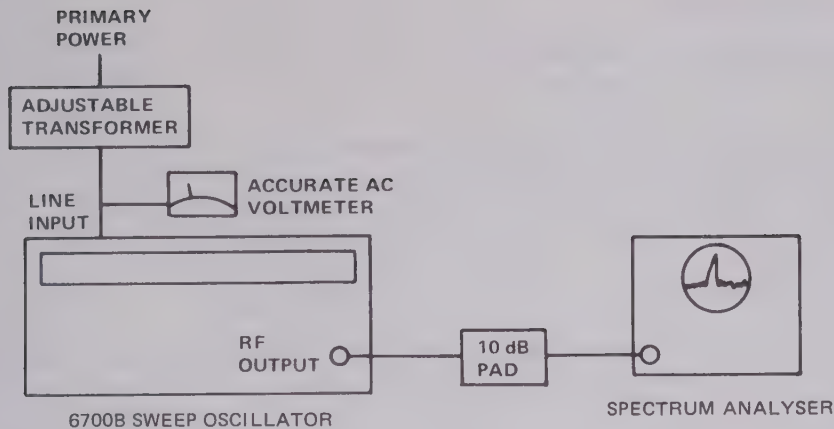


Fig. 4 ΔF vs. $\pm 10\%$ line change test set-up

10. Frequency modulation

(1) Connect equipment as shown in Fig. 5.

(2) Set controls as follows:

SWEEP FUNCTION	SYM M1
SWEEP TIME	MAN
SYMMETRICAL	
SWEEP WIDTH	Fully anti-clockwise
M1	Centre of range
FREQUENCY METER	Same frequency as M1

(3) Set the audio oscillator output for approx. 50 mV peak-to-peak.

(4) Adjust frequency meter for maximum vertical deflection on oscilloscope.

(5) Observe demodulated f.m. on oscilloscope while varying the f.m. input frequency from d.c. to the upper figure specified in Table 1, Chap. 1.

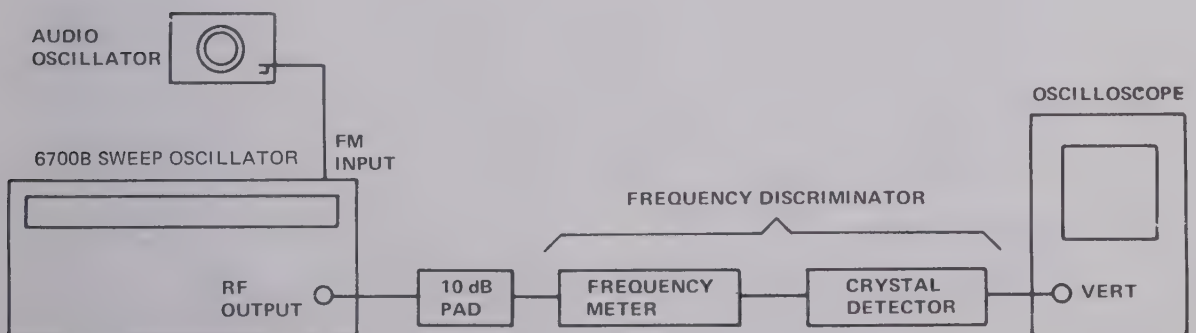


Fig. 5 Frequency modulation test set-up

Power output (unlevelled)

11. (1) Connect the power meter to the RF OUTPUT connector through a 10 dB pad. Do not use intervening cabling.

- (2) Set type 6700B controls as follows:

SWEEP FUNCTION	CW M1
1 kHz ☐	Off (down)
RF LEVEL	Fully clockwise
LEVELLER MODE	Off

- (3) Adjust the M1 control across the band and note the minimum output power level indicated on the power meter.

Note...

Power meter and pad calibration factors must be taken into account when checking the power output level.

- (4) The minimum power indication should be equal to or higher than the minimum power output level (mW) stated in the r.f. unit specifications.

Power variation (levelled)12. Internal levelling

- (1) Connect a power meter to the RF OUTPUT connector through a 10 dB pad. Do not use intervening cabling.

- (2) Set type 6700B controls as follows:

MARKER AMPLITUDE	Fully anti-clockwise
SWEEP FUNCTION	F1 - F2
SWEEP TIME	MAN
F1	Low end of band
F2	High end of band
1 kHz ☐	Off (down)
LEVELLER MODE	INT

- (3) Adjust the RF LEVEL control so that the unlevelled indicator just remains extinguished while the SWEEP TIME (SEC) VARIABLE control is rotated through its entire range and note maximum and minimum power levels (dB) as indicated on the power meter.

- (4) The total power variation observed in step (3) should not exceed the total variation specified for the r.f. unit. The pad calibration must be taken into account.

13. External levelling

- (1) Connect equipment as shown in Fig. 6.

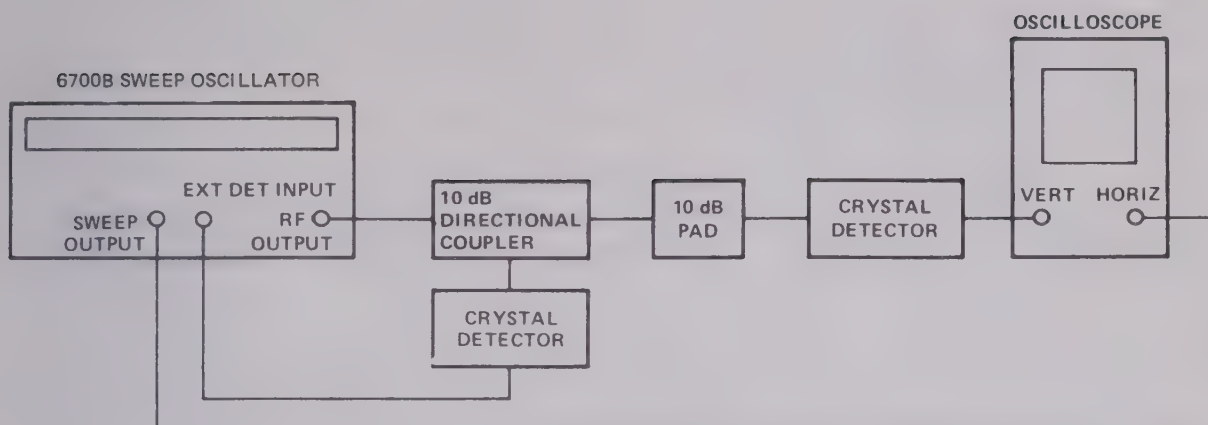


Fig. 6 External levelling measurement test set-up (1)

(2) Set controls as follows:

TRIGGER	LINE
SWEEP FUNCTION	F1 - F2
SWEEP TIME (SEC)	.01
F1	Low end of band
F2	High end of band
1 kHz ☐	Off (down)
SWEEP RESPONSE TIME	AUTO
LEVELLER MODE	EXT XTAL*

- (3) Adjust the RF LEVEL control over its range and then rotate it away from the fully clockwise position just enough to obtain levelling across the entire band, making sure that the UNLEVELLED indicator remains extinguished.
- (4) Replace the oscilloscope and crystal detector with an r.f. power meter as shown in Fig. 7.
- (5) Set the SWEEP TIME control to MAN.
- (6) Rotate the VARIABLE SWEEP TIME control through its entire range and note the maximum and minimum power meter indications (dB).
- (7) The total power variation observed in step (6) should be less than the total variation specified for the r.f. unit. The effect of the external crystal detector in addition to the 10 dB pad and external directional coupler variation must be taken into account.

*XTAL/PWR MTR slide switch is located on top left hand side of r.f. unit, near the front panel.

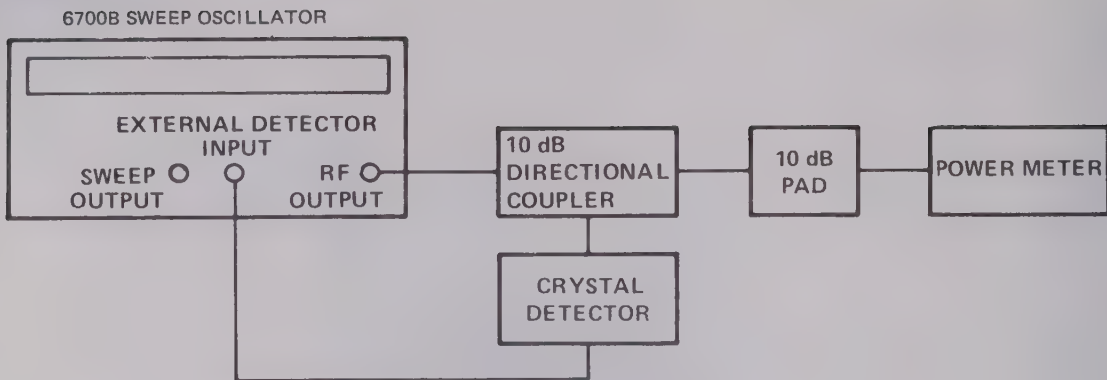


Fig. 7 External levelling measurement test set-up (2)

14. Power meter levelling

(1) Connect equipment as shown in Fig. 7 with the following exceptions: substitute a power meter (HP model 432A recommended) for the crystal detector and connect the d.c. output (recorder output) to the EXT DET INPUT on the r.f. unit.

(2) Set the controls as follows:

MARKER AMPLITUDE	Fully anti-clockwise
SWEEP FUNCTION	F1 - F2
SWEEP TIME	MAN
F1	Low end of band
F2	High end of band
1 kHz ☐	Off (down)
LEVELLER MODE	EXT with XTAL/PWR MTR slide switch set to PWR MTR

(3) Set the power meter range switch such that, with the RF LEVEL control at maximum, the reading does not fall below mid-scale as the frequency is varied over the entire band.

Note...

Because the thermal response of the power meter is relatively slow, the levelling loop bandwidth in the power meter levelling mode will be considerably less than in the XTAL mode. Therefore, it is necessary to sweep slowly in order to not exceed the bandwidth of the levelling loop.

(4) Rotate the RF LEVEL control away from its fully clockwise position just enough to obtain levelling across the entire band, making sure that the UNLEVELLED indicator remains extinguished. The front panel GAIN adjust is functional only in the POWER METER mode, the gain being automatically adjusted when in the XTAL mode, and may have to be adjusted for the particular power meter being used.

- (5) Rotate the VARIABLE SWEEP TIME control through its entire range and note the maximum and minimum power meter indications (dB).
- (6) Maximum power variation should be less than ± 0.1 dB.
- (7) Re-position the XTAL/PWR MTR switch to its XTAL setting.

Internal square wave

15. Unlevelled

- (1) Connect equipment as shown in Fig. 1, except that the frequency meter may be omitted and the 10 dB pad connected direct to the crystal detector. Also, remove the cable between the SWEEP OUTPUT of the type 6700B and the horizontal input of the oscilloscope.

Note...

The output of the crystal detector (connected to the oscilloscope) should be shunted by a resistor of approximately $600\ \Omega$ to reduce the time constant of the crystal detector and coaxial cable capacitance.

- (2) Set controls as follows:

SWEEP FUNCTION	CW M1
M1	Mid-band
1 kHz $\square$	ON
RF LEVEL	Fully anti-clockwise
LEVELLER MODE	OFF

- (3) Using the oscilloscope time base, measure square wave rise time, fall time and period. Both rise and fall times should be $10\ \mu\text{s}$ maximum. The period should be adjustable from less than 950 to more than $1050\ \mu\text{s}$ by means of the front-panel screwdriver adjustment immediately above the 1 kHz $\square$ switch.

16. Levelled

- (1) If the r.f. unit has Option-01, use the same equipment set-up as used in para.15 and set controls as follows:

LEVELLER MODE	INT
1 kHz $\square$	ON
RF LEVEL	Rotate until UNLEVELLED indicator just goes out

- (2) If the r.f. unit does not have Option-01, connect equipment as shown in Fig. 5-6 and set the controls as described in step (1) except that the LEVELLER MODE must be set to XTAL EXT.
- (3) Using the oscilloscope time base, measure both rise and fall time and symmetry. Rise and fall time should each be $10\ \mu\text{s}$ maximum; symmetry within 60:40.

External a.m.

17. (1) Connect equipment as shown in Fig. 6.

(2) Set controls as follows:

SWEEP FUNCTION	CW M1
M1	Mid-band
1 kHz $\square$	Off (down)
RF LEVEL	Mid range (approximate)
LEVELLER MODE	OFF

(3) Connect the output from a square wave generator to the rear panel AM INPUT. Adjust amplitude so that a further increase does not increase the r.f. amplitude. A positive voltage increases the output power while a negative voltage decreases the output power.

(4) Rise and fall times should not exceed 2 μ s; maximum amplitude into the AM INPUT connector should not exceed either +10 or -10 V.

(5) Set controls as follows:

LEVELLER MODE	INT
1 kHz $\square$	Off (down)
RF LEVEL	Mid-range (approx.)

(6) Repeat step (3) and check that rise and fall times do not exceed 3 μ s.

Symmetrical sweep width accuracy

18. (1) Connect equipment as shown in Fig. 1.

(2) Set controls as follows:

1 kHz $\square$	Off (down)
MARKER AMPLITUDE	Fully anti-clockwise
TRIGGER	LINE
SWEEP FUNCTION	SYM M1
SWEEP TIME (SEC)	.1
M1	Centre of band
RF LEVEL	Fully clockwise
LEVELLER MODE	OFF
SWEEP RESPONSE TIME	AUTO

(3) At each setting of the SYMMETRICAL SWEEP WIDTH control to be checked (depending on r.f. unit) tune the frequency meter to both the high and the low end of the frequency range being swept and note the two different frequency readings.

(4) The difference between the two frequency meter readings and the corresponding frequency limits of the calibrated settings of the SYMMETRICAL SWEEP WIDTH control should be within $\pm 3\%$ for YIG tuned r.f. units and $\pm 10\%$ of sweep width $\pm 0.25\%$ of maximum frequency for varactor tuned r.f. units.

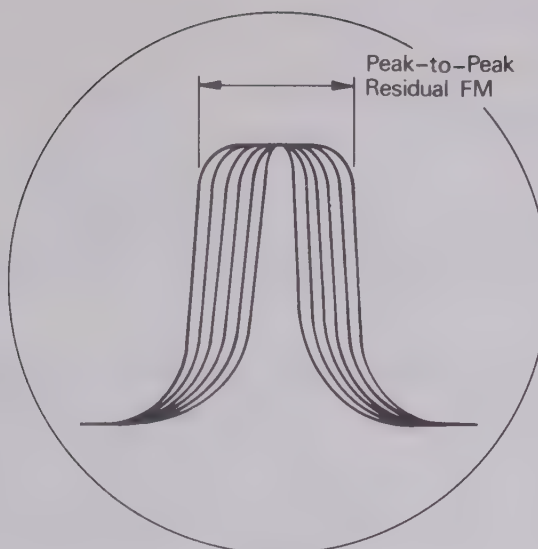


Fig. 8 Spectrum analyser display

Residual f.m.

19. (1) Connect RF OUTPUT via a 10 dB pad and coaxial cable to a spectrum analyser.
- (2) Set controls as specified in para.18 (2), except that TRIGGER should be moved to EXT.
- (3) Locate and identify the M1 signal on the spectrum analyser and progressively decrease scan width, bandwidth, and time-base speed until a display similar to Fig. 8 is obtained with bandwidth as small as is practicable.
- (4) Divide the peak-to-peak residual f.m. observed by 2 to obtain peak residual f.m. This should not exceed the specification for the r.f. unit being used.

Note...

To ensure that the auto bandwidth circuitry is functioning properly, place the SWEEP RESPONSE TIME slide switch (on rear panel) to FAST. The residual f.m. should increase considerably. Then set the switch back to AUTO. Within a few seconds, the residual f.m. should decrease to its minimum value indicating that the bandwidth has been reduced.

- (5) Repeat the measurement with M1 set to the nominal low end of band and the nominal high end of band.

Proportional sweep amplitude

20. (1) Connect the PROPORTIONAL OUTPUT (rear panel) to the oscilloscope vertical input.

- (2) Set controls as follows:

TRIGGER	LINE
SWEEP FUNCTION	F1 - F2
SWEEP TIME (SEC)	0.1
F1	Lower limit
F2	Upper limit
PROPORTIONAL	10V/BAND

- (3) The PROPORTIONAL OUTPUT voltage should start at +0.25 (± 0.25) V and finish at +9.75 (± 0.25) V.
- (4) Set the rear panel PROPORTIONAL switch to 40 V/OCTAVE.
- (5) The PROPORTIONAL OUTPUT voltage should now start at +1 (± 1) V and finish at +40 (± 3) V for r.f. units covering a full octave. The 6766A and the 6774A r.f. units do not cover a full octave and therefore the end frequency voltage will be proportionately less.

CALIBRATION PROCEDURE

21. In the following paragraphs, reference is made to test points. As an aid in locating these points, use Fig. 9 (a) to (e). These figures provide maps of all test points in the r.f. unit.

Bias supply

22. Most oscillators carry a label on which their bias voltages are printed, but more detailed information is provided at the front of the copy of this instruction manual supplied with the particular r.f. unit. Some oscillators, notably those made by Avantek, have more complex requirements including linear variation of one bias voltage by the tuning voltage signal. To avoid unnecessary confusion here, these oscillators are treated separately in Supplement 1.

23. For oscillators requiring a fixed bias voltage, checks and adjustments are made thus:

- (1) Connect precision voltmeter to the main p.c. board A2 as follows:

YIG-tuned models:	TP3 (+); TP2(-)
Varactor-tuned models:	TP6 (+); TP5(-)

- (2) Turn on a.c. power.
- (3) For YIG tuned units, adjust R18 (for varactor-tuned units, R15) to obtain exactly the required voltage.
- (4) To check short-circuit current limiting, connect an ammeter momentarily between the points given in Table 3 and verify that the reading lies between the limits stated there.
- (5) Connect oscilloscope leads thus:

Unit type/bias polarity	YIG/+	YIG/-	Var/-
Signal lead	TP3	TP2	TP5
Ground lead	TP2	TP3	TP6

- .6) Switch a.c. power ON and OFF several times and verify that the oscilloscope shows no overshoot on the rise of bias voltage.

Crowbar

24. (1) If the oscillator is YIG-tuned, disconnect its bias supply leads from terminals M and N of the A3 printed circuit board as indicated in Table 3.
If the r.f. unit is a type 6730A or 6790A, disconnect the negative bias supply lead from the oscillator. (RF source terminals are shown in Fig. 10). If a Zener diode is fitted between A3-3 and A3-5, temporarily disconnect one end of it.
- (2) In order to cause the output voltage of the bias supply circuit to increase without disturbing the normal setting established in para. 23 (3), temporarily connect a 47 k Ω fixed resistor in series with a 500 k Ω variable resistor across A2 R19 (for YIG-tuned units) or A2 R23 (for varactor-tuned units).
Set the variable resistor to maximum resistance.
- (3) Connect a precision voltmeter between test points on the A2 printed circuit board indicated in the table in para. 23.
- (4) Switch on power and slowly reduce the resistance of the 500 k Ω potentiometer, while watching the voltmeter, until the crowbar fires (indicated by voltage falling to less than 2). For YIG-tuned units, the voltmeter reading just before the crowbar fires should be 4 to 7 % above the normal operating bias voltage for the particular oscillator. For the varactor-tuned oscillator used in types 6730A and 6790A, the reading should be between 21.0 and 22.5 V.
As soon as the crowbar has fired, switch off and reset the 500 k Ω potentiometer to maximum before repeating the measurement, if necessary.
- (5) If adjustment of the crowbar circuit is necessary, a decade resistor box should be used to establish a new value for A2 R10 (YIG-tuned units) or A2 R4 (varactor-tuned units). A 0.01 μ F capacitor should be connected across the leads to the decade box in order to avoid pick-up which might cause erroneous firing of the crowbar.
- (6) Disconnect the 47 k Ω resistor and 500 k Ω potentiometer and turn the unit on and off several times. Check that the crowbar circuit does not fire after turn on.
- (7) If a Zener diode between A3-3 and A3-5 was disconnected at step (1), it should now be re-connected.

TABLE 3 BIAS SUPPLY SHORT CIRCUIT SPECIFICATION

Model No.	Bias supply terminals on A3 board		Minimum short circuit current (A)	Maximum short circuit current (A)
	+	-		
6730A (MI)	H	J	0.35	0.5
6738A (AV)	L	N	0.8	1.1
6742A (AV)	L	N	0.8	1.1
6754A (AV)	L	N	0.8	1.1
6760A (MI)	M	N	1.2	1.5
6766A (MI)	M	N	1.2	1.5
6766A (VA)	M	N	0.9	1.2
6770A (MI)	M	N	1.2	1.5
6774A (MI)	M	N	0.9	1.4
6774A (VA)	M	N	0.9	1.4
6790A (MI)	A2-25	A2-30A	0.35	0.5

Oscillator manufacturers:

MI - Marconi Instruments/
Sanders Div.

AV - AvanteK

VA - Varian Associates

YIG tuning supply

25. See Fig. 10 to determine whether your r.f. unit is YIG tuned or varactor tuned.

- (1) Turn off a.c. power.

Secondary loop calibration

26. (1) Connect a jumper across the FM terminals J and H on the Assembly A3.

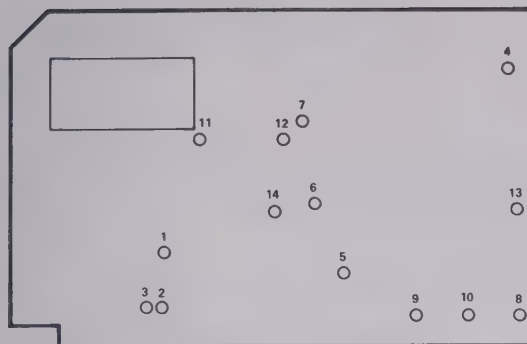
- (2) Connect an oscilloscope to TP10 and set the sweeper controls as follows:

SWEEP FUNCTION	F1 - F2
SWEEP TIME (SEC)	.01
VARIABLE	Fully clockwise

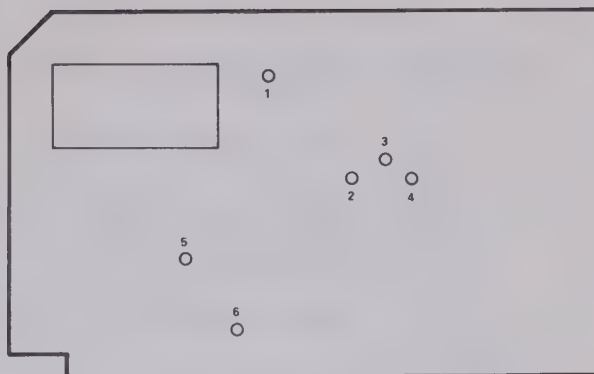
- (3) Place a jumper across CR42.

- (4) Observe the oscilloscope display shown in Fig. 11.

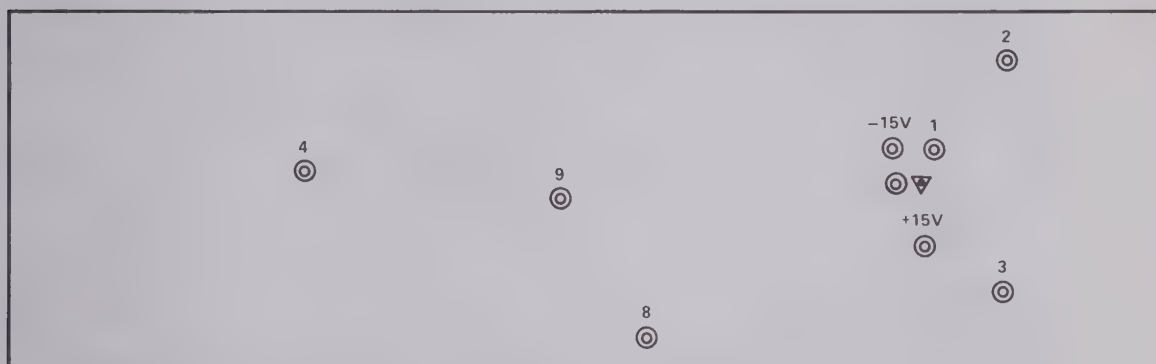
- (5) Adjust R89 (SECONDARY LOOP OFFSET) so that amplitude B is equal to approximately 1/8 of amplitude A.



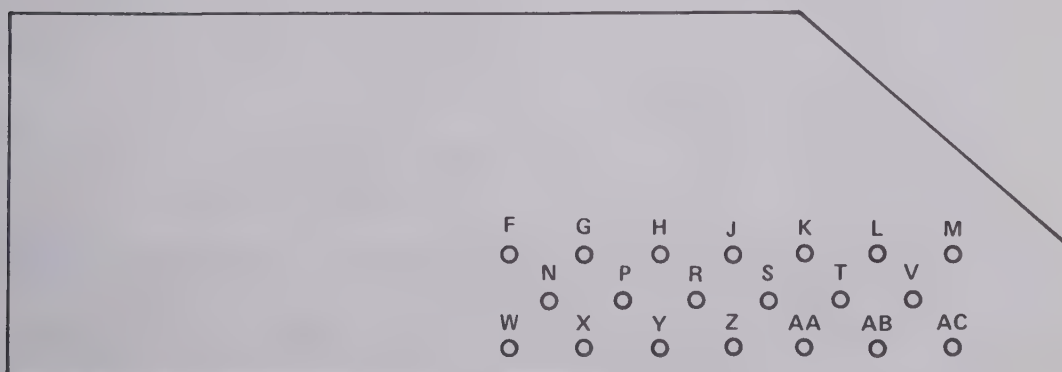
(a) A2 board
(YIG tuned r.f. units only)



(b) A2 board
(varactor tuned r.f. units only)



(c) Leveller board (A1)



(d) A3 board

Fig. 9 Test point maps

- (6) Remove jumper across CR42 and observe the display return to normal as shown in Fig. 12.
- (7) Connect oscilloscope to TP6.
- (8) Observe oscilloscope display as shown in Fig. 13 and adjust R108 (SECONDARY LOOP TRACKING) to obtain a horizontal line as illustrated by line 1 and having zero slope.
- (9) Remove jumper connected across terminals J and H on assembly A3.

Primary loop calibration

27. (1) Connect equipment as shown in Fig. 14.

- (2) Set controls as follows:

Front panel

TRIGGER	Line
MARKER AMPLITUDE	Clockwise
SWEEP FUNCTION	F1 - F2
SWEEP TIME (SEC)	.1
VARIABLE	Fully anti-clockwise
F1	Low Limit
F2	High Limit
1 kHz ☐	Off (down)
AC SUPPLY	On (up)

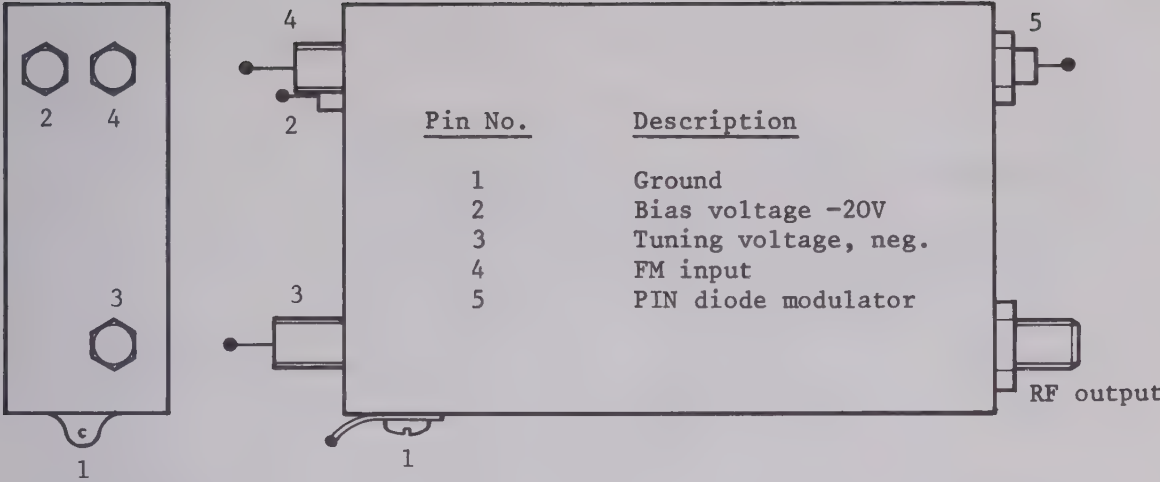
Rear panel

SWEEP RESPONSE TIME	Auto
RF MARKERS	On

RF unit

RF	On
If the r.f. unit has Option 1 (internal levelling) set:	
LEVELLER MODE	INT (depress)
RF LEVEL	Adjust until levelling is just obtained across entire band.
If the r.f. unit does not have Option 1, set:	
LEVELLER MODE	OFF (depress)
RF LEVEL	Fully clockwise

- (3) Set the M1 and M2 indicators at the low and high calibrated limits (e.g. 4.00 and 8.00 GHz) respectively.
- (4) Set the frequency meter to the low limit (4.00 GHz in this example).
- (5) Adjust R31 (PRIMARY LOOP OFFSET) to make the frequency meter dip coincide with the marker.
- (6) Set the frequency meter to the high end limit (8.00 GHz in this example).



Connections (6790A only)

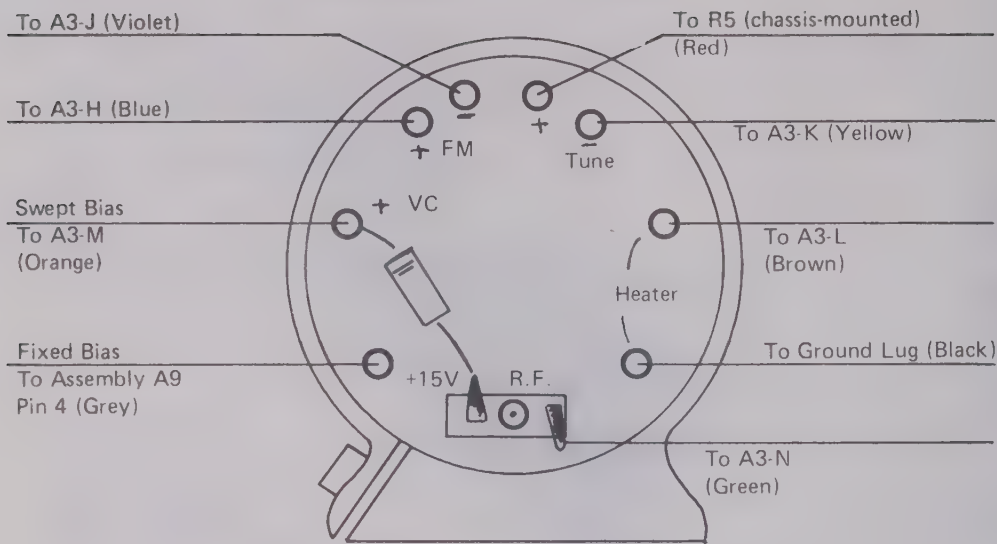
<i>Pin No.</i>	<i>Wire colour</i>	<i>Destination</i>
1	White	A2 - 25
2	White/brown	A2 - 30A
3	Violet	A2 - 29
4	Yellow	A2 - 18
5	Coax. inner	A1 - 20

Connections (6730A only)

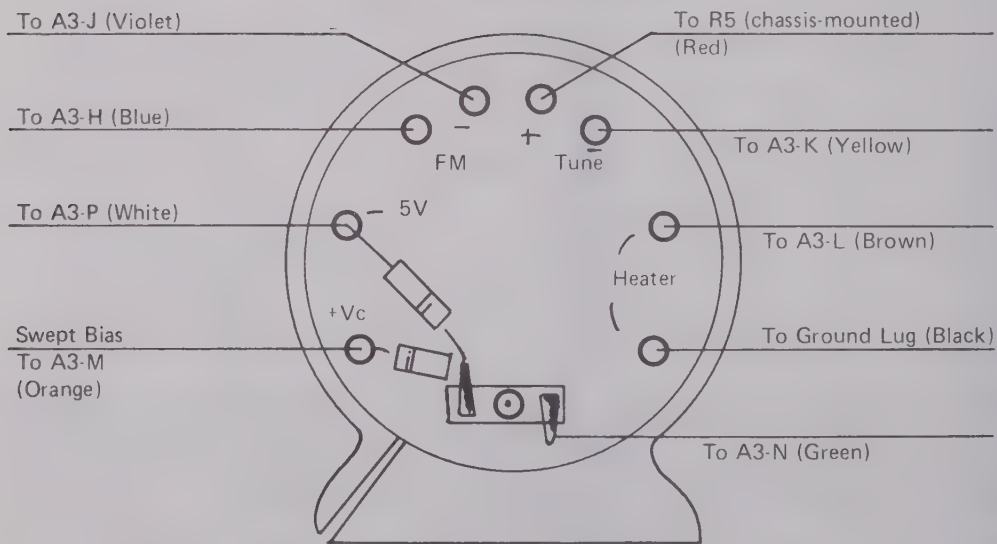
<i>Pin No.</i>	<i>Wire colour</i>	<i>Destination</i>
1	White	A3 - H
2	White/brown	A3 - J
3	Violet	A3 - K
4	Yellow	A2 - 18
5	Coax. inner	A1 - 20

(a) RF UNITS 6790A and 6730A (after Ser. No. 150) MI oscillator type 6790A/005, 1.0 - 2.1 GHz, varactor-tuned. (On some 6730A units, f.m. input components are located on assembly A3 instead of A2, in which case the yellow lead goes to A3 - AB.)

Fig. 10 RF source terminal location

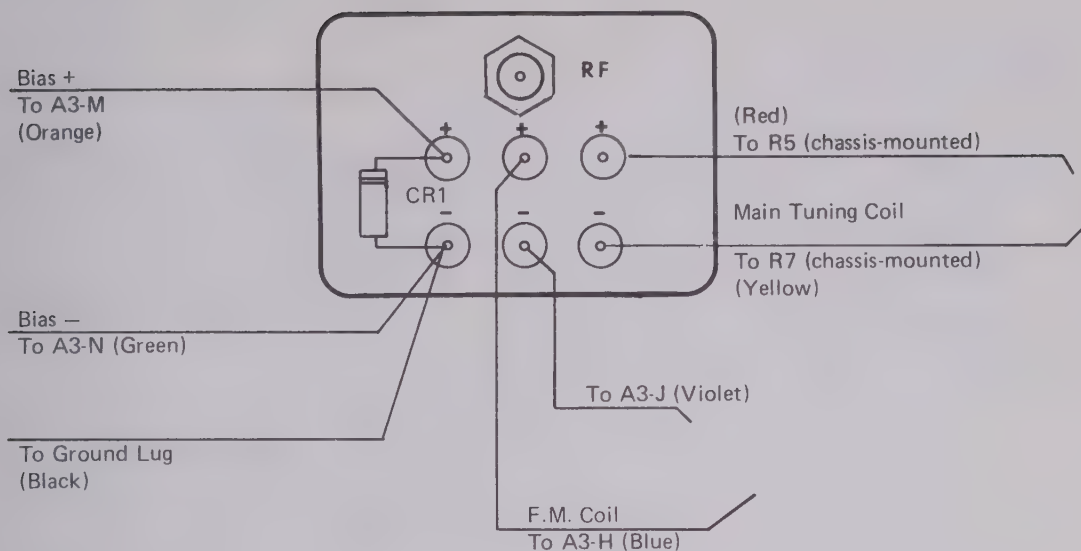


(b) RF UNITS 6738A and 6742A (Avantek)
Avantek Oscillators, YIG-tuned, 1.7-4.3 GHz and 2.0-4.0 GHz.

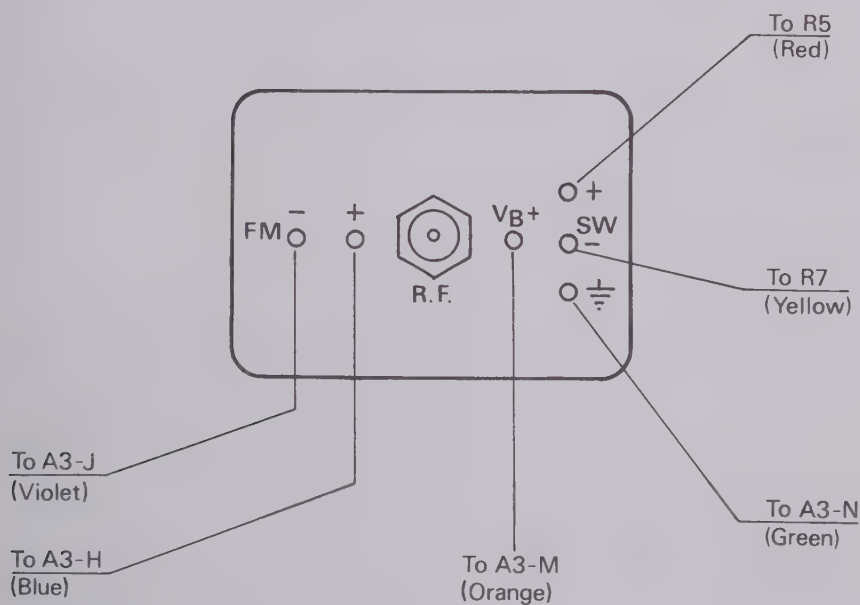


(c) RF UNIT 6754A (Avantek)
Avantek Oscillator, YIG-tuned, 4.0-8.0 GHz.

Fig. 10 (cont.) RF source terminal location



- (d) RF UNITS 6766A and 6774A (Varian)
Varian Oscillators, YIG-tuned, 8-12.4 GHz and 12.4-18.0 GHz.

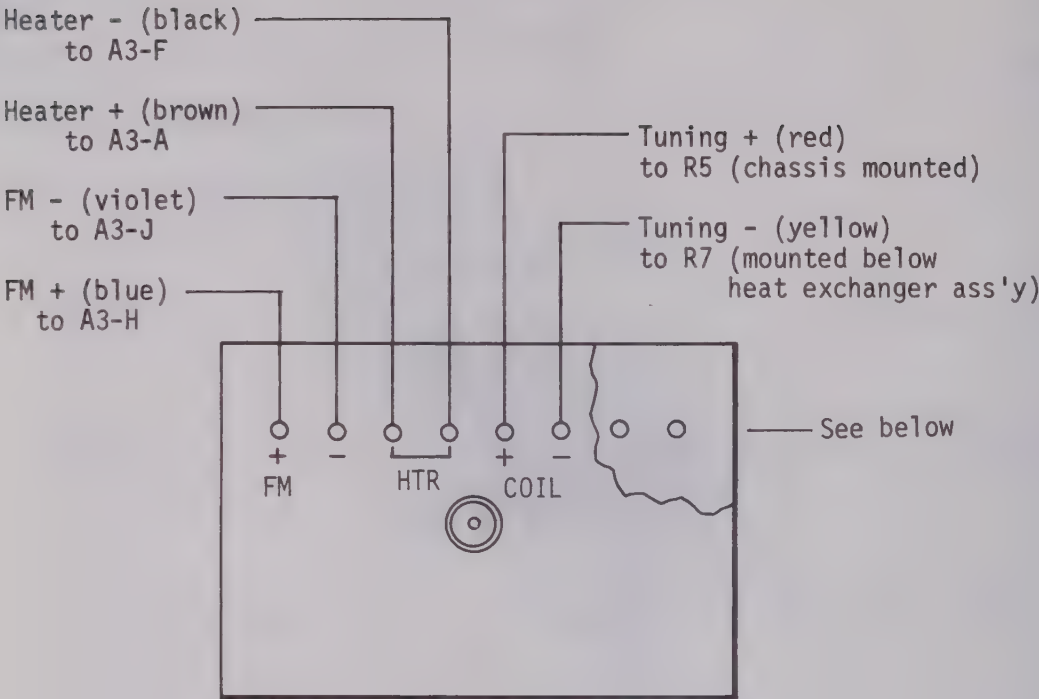


Note...

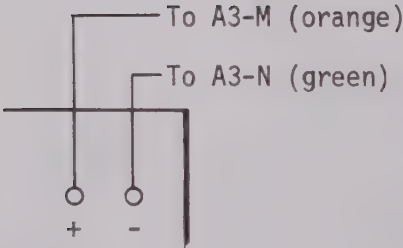
Zener diode CR1 may be located on oscillator terminals or on A3 assembly.

- (e) RF UNITS 6766A and 6774A (Varian)
Alternative pin configuration.

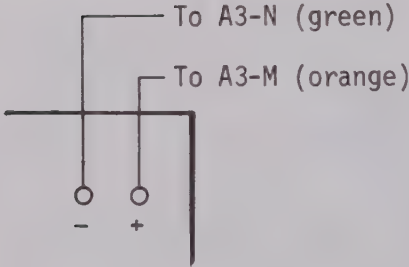
Fig. 10 (cont.) RF source terminal location



Bias supply alternatives



For NEGATIVE bias to
Gunn diode, positive grounded



For POSITIVE bias to
Gunn diode, negative grounded

(f) RF UNITS 6760A, 6766A, 6770A and 6774A using MI Sanders Division YIG-tuned oscillators, 7-11 GHz, 8-12.4 GHz, 10-15 GHz and 12.4-18 GHz.

Fig. 10 (cont.) RF source terminal location

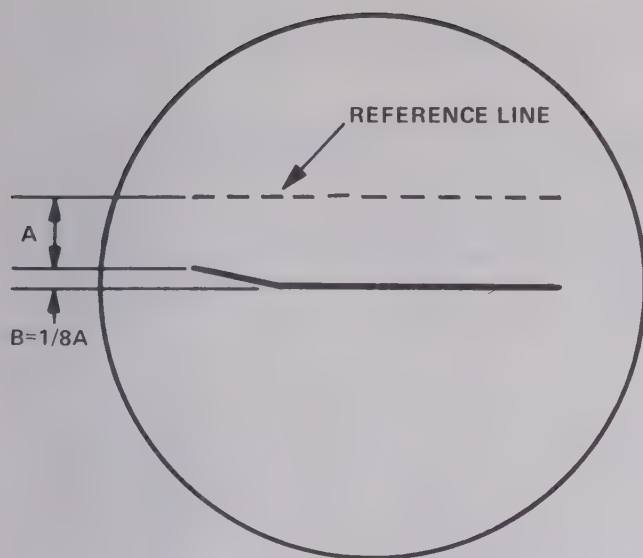


Fig. 11
Oscilloscope display, offset

Fig. 12
Oscilloscope display, ramp

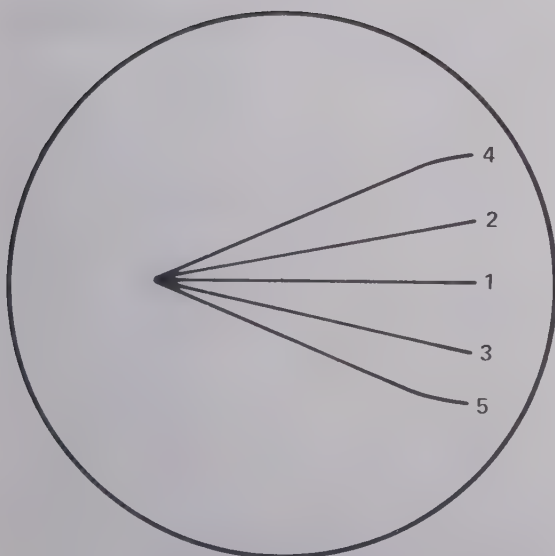
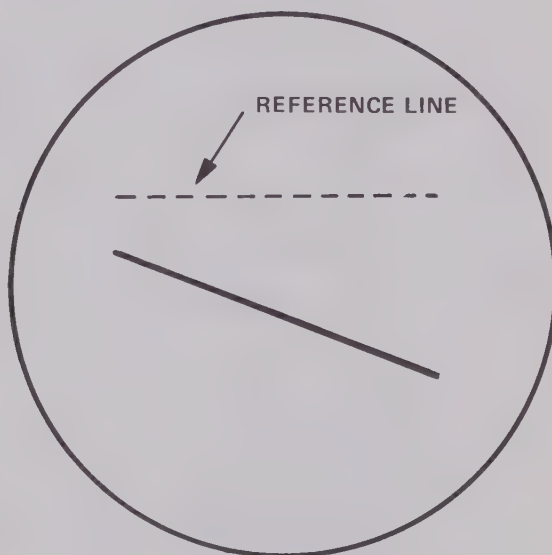


Fig. 13
Oscilloscope display, tracking

- (7) Adjust R104 (PRIMARY LOOP TRACKING) to make the frequency meter dip coincide with the marker.
- (8) Since there is some interaction between controls R31 and R104, repeat steps 4 to 7 until no further adjustments are required.
- (9) Place a jumper across CR30 (to disable secondary loop) and verify that the frequency markers are still calibrated. If not, go back to para.26 and repeat all steps. Remove jumper from CR30 except during this step.

YIG lag compensation

28. (1) Connect equipment and set controls as indicated in para.27 step 2.
- (2) Place a jumper across CR29 (to disable high frequency clamp).
- (3) Turn MARKER AMPLITUDE fully anti-clockwise.
- (4) Turn the SWEEP TIME (SEC) control to .01 and rotate the VARIABLE control several times between its extreme positions. The oscilloscope display will shift a small amount when this is done. Adjust R50, YIG COMPENSATION, to minimize this shift.
- (5) Remove jumper across CR29.

High frequency clamp

29. (1) Connect equipment as shown in Fig. 15.
- (2) Set the sweeper controls as follows:

Front panel

TRIGGER	LINE
MARKER AMPLITUDE	Clockwise
SWEEP FUNCTION	SYM M1
SWEEP TIME (SEC)	.1
VARIABLE	Fully anti-clockwise
F1	Low Limit
F2	Max. clockwise
1 kHz ☐	OFF (down)
AC POWER	On (up)
M1	2/3 Full Scale
SYM SWEEP SWITCH	Switch fully clockwise
ON RF UNIT	VARIABLE fully clockwise

Rear panel

SWEEP RESPONSE TIME	AUTO
RF MARKERS	ON

RF unit

RF	ON
LEVELLER MODE	OFF (Depress)
RF LEVEL	Fully clockwise

- (3) Adjust R87 so that F2 MARKER is partially removed from display.

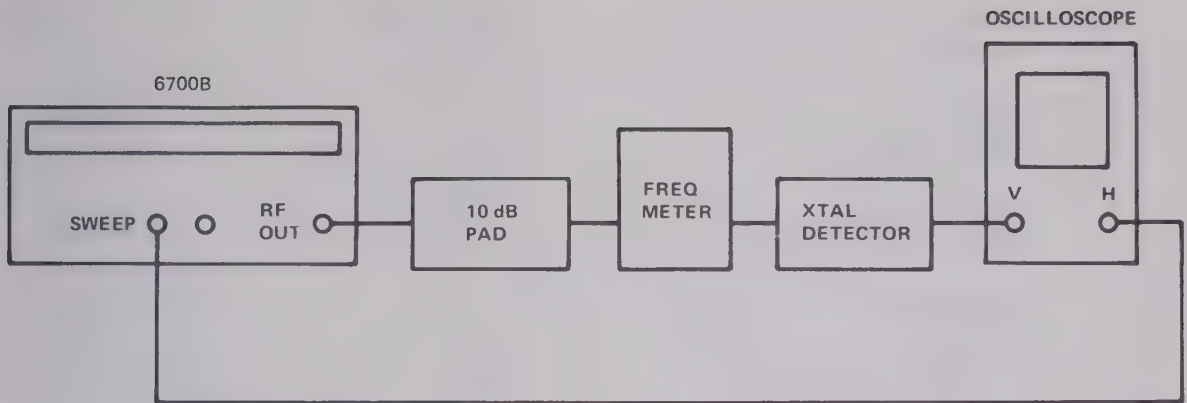


Fig. 14 Primary loop calibration test set-up

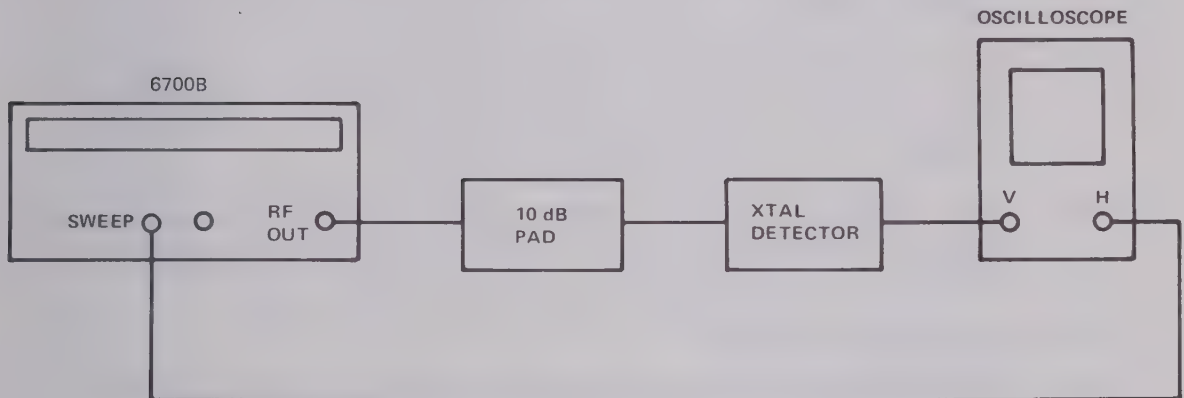


Fig. 15 High frequency clamp calibration test set-up

Varactor tuning supply (types 6730A and 6790A only)

30. (1) Connect equipment as shown in Fig. 14.
- (2) Set sweeper controls as follows:

Front panel

SWEEP FUNCTION	F1 - F2
SWEEP TIME (SEC)	.1
SWEEP TIME (SEC) VARIABLE	Fully clockwise
TRIGGER	AUTO
F1	Low limit
F2	High limit
M1	Low calibrated limit (e.g. 1.00 GHz)
M2	High calibrated limit (e.g. 2.00 GHz)
MARKER AMPLITUDE	As desired

1 kHz $\square$	OFF (down)
AC POWER	On (up)

RF unit

LEVELLER MODE	INT (For 6790A and 6730A-1)
	OFF (For 6730A)
RF ON-OFF	ON (up)
BAND switch (6790A)	1 - 2 GHz

Rear panel

RF MARKER	ON
RF DURING RETRACE	OFF

- (3) Allow the instrument to warm up for 30 minutes.
- (4) With the M1 indicator set at exactly the low calibrated limit (e.g. 1.00 GHz), tune the frequency meter until its frequency dip coincides with the M1 marker dip on the oscilloscope. Record the frequency error.
- (5) Prepare a graph of frequency error versus frequency (typical error curve shown in Fig. 16), by plotting the difference between the frequency meter reading and the M1 indicator setting at 50 MHz increments up to the high end of the band.
- (6) If the frequency error plot only slightly exceeds the specification limits, proceed to para.31. If the plot drastically exceeds the limits, proceed to para.32.

31: Minor frequency adjustment

- (1) Turn off main power and remove the r.f. unit from the mainframe.
- (2) Remove the top cover of the r.f. unit and lift up the tuning and bias supply assembly A2 p.c. board.
- (3) Using an extender cable, connect the r.f. unit to the mainframe and ensure that the mainframe and r.f. unit controls are set as specified in para.30 step (2).
- (4) An r.f. unit slightly out-of-specification with nearly constant error over the band can, in most cases, be brought within limit by making a small adjustment to the OFFSET potentiometer, A2R84 (See Chap. 7 Fig. 6).
- (5) An r.f. unit slightly out-of-specification with linearly increasing error can usually be corrected by a small adjustment of the GAIN potentiometer, A2R78 (See Chap. 7 Fig. 6).
- (6) A slight out-of-specification condition above about 20% of band can usually be corrected by adjusting the appropriate BREAK POINT potentiometers, A2R50, R52 R54 or A2R56 to R63. Proceed with the following steps to determine which break point potentiometer should be adjusted.

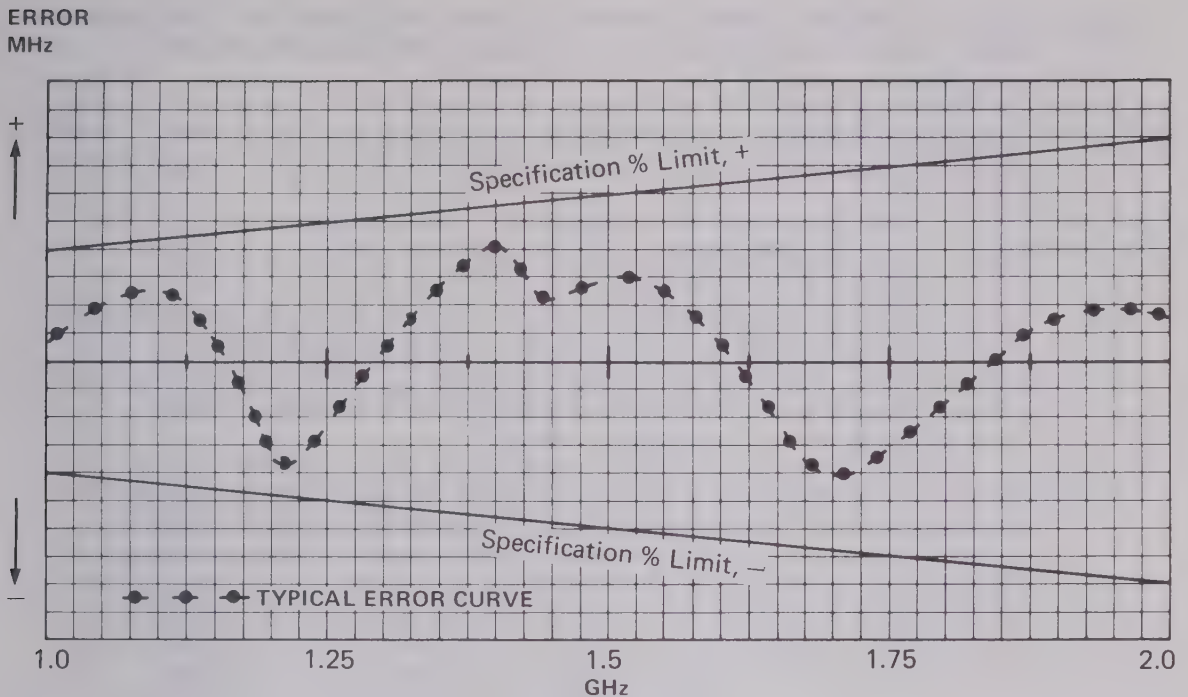


Fig. 16 Typical frequency error plot for varactor tuned r.f. unit

- (a) With the equipment still connected as shown in Fig. 14, set the M1 indicator and the frequency meter to the out-of-specification frequency.
- (b) Using clip leads, connect a resistor of approximately $1\text{ k}\Omega$ in parallel with each shaping resistor, starting with A2R37 and working toward A2R27 while observing the oscilloscope display.
- (c) When the position of the frequency meter dip is affected, the corresponding BREAK POINT potentiometer should be adjusted slightly until the M1 marker dip coincides with the frequency meter dip.
- (7) Any adjustments made in steps (5) to (7) may affect the frequencies above the corrected one. Therefore, it may be necessary to repeat steps (4) to (6).

32. Major tuning supply maintenance, 1-2 GHz range

CAUTION...

Turn off main power while soldering components or wire on p.c. boards.

- (1) Set up equipment as shown in Fig. 14. Turn off main power and remove the r.f. unit from the mainframe.
- (2) Remove the top cover from the r.f. unit and lift up the tuning and bias supply assembly A2 p.c. board.

- (3) Using an extender cable, connect the r.f. unit to the mainframe and ensure that the mainframe and r.f. unit controls are set as specified in para.30 step (2).
- (4) Unsolder and lift one side of resistor A2R48 (see Fig. 7-6). This removes the shaping network from the feedback circuit of the tuning supply.
- (5) Connect the oscilloscope vertical input to A2TP2.
- (6) Turn on a.c. power and observe that a linear negative ramp voltage starting at approximately -13 to -15 volts is present on the oscilloscope. (See waveform A, Fig. 17). If this waveform is not present standard trouble-shooting procedures should be used. If waveform is present proceed to step (7).
- (7) Using clip leads, momentarily connect a 10 k Ω resistor in parallel with A2R79. The slope of the ramp voltage should become more negative if the circuit is functioning properly (see waveform B, Fig. 17).

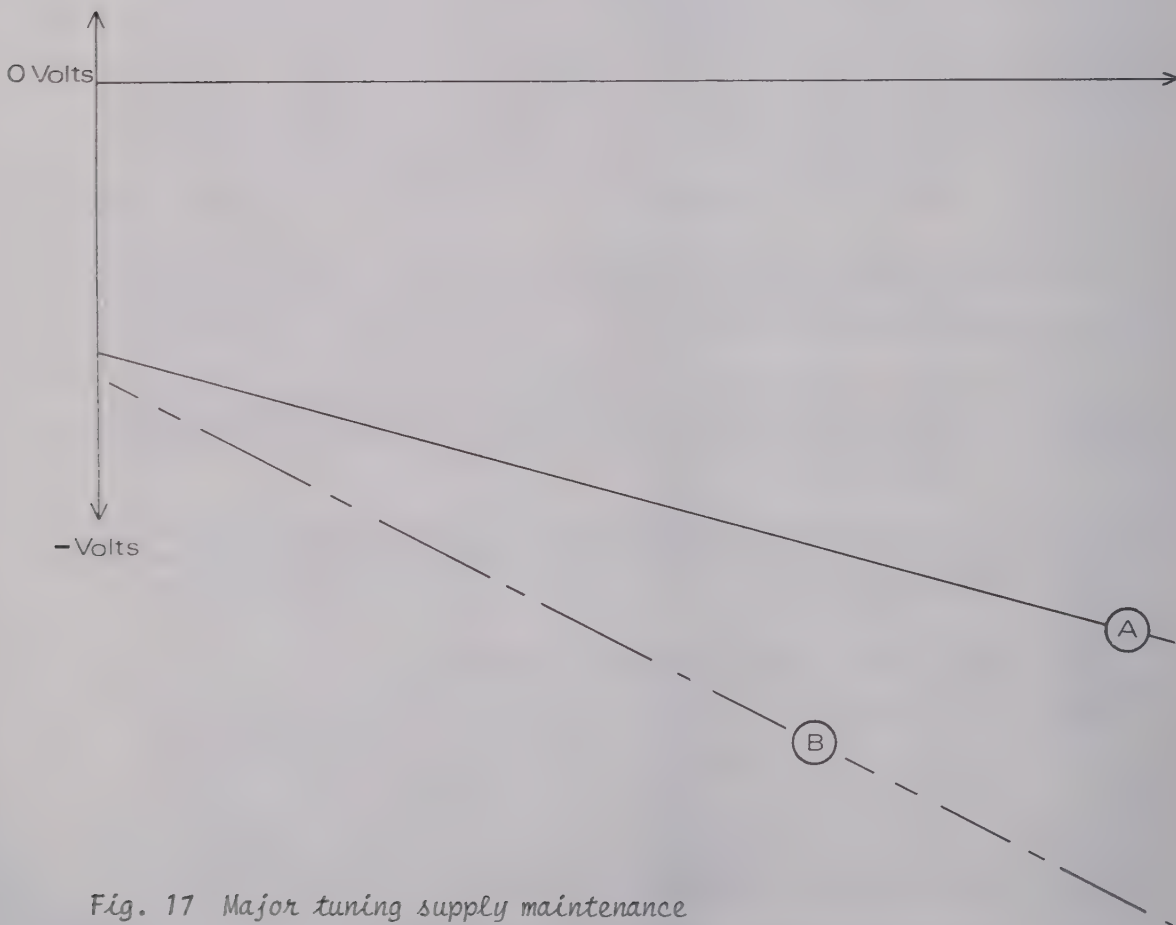


Fig. 17 Major tuning supply maintenance
ramp voltage waveform

- (8) Resolder A2R48 and make a frequency error plot as described in para.30, steps (4) and (5).
- (9) If the r.f. unit cannot be brought within the frequency accuracy specification by the minor frequency adjustment procedure (para.31), proceed with the following steps.
- (10) If the voltage of TP2 can be made to cover the end-frequency values stated on page 1-0 of the copy of this instruction manual supplied for the particular r.f. unit, check that the frequency is correct when these two values of tuning voltage are reached.
- (11) Set the M1 marker dip and the frequency meter dip at exactly the low calibrated limit.
- (12) Turn off a.c. power and replace A2R85 with a resistance decade box set to the value of A2R85. Adjust potentiometer A2R84 (a multi-turn unit) to the centre of its range.
- (13) Turn on a.c. power and adjust the resistance decade box so that the M1 marker dip and the frequency meter dip are approximately coincident. The decade resistance box setting now indicates the proper value for the replacement A2R85. Adjust A2R84 until the M1 and frequency meter dips are in coincidence.
- (14) Move the M1 indicator step by step (to scale divisions at approximately 1 cm intervals). Read the actual frequency with the frequency meter and plot the frequency error. Continue this procedure until the frequency error exceeds the specification limit. Then perform the step (15) or (16) as appropriate.
- (15) If the out-of-specification condition begins below 10% of scale, replace A2R79 with a resistance decade box. Position potentiometer A2R78 (20-turn unit) to the centre of its range and adjust the decade box until the M1 marker dip and the frequency meter dip are coincident. Potentiometer A2R84 and the resistance decade box may both have to be adjusted for the best overall accuracy over the first 10% of scale. Replace A2R79 with a resistor having the value indicated by the decade box setting.
- (16) For out-of-specification frequencies above 10% of band, the following alignment procedures should be used.
 - (a) Locate the appropriate break point by using the method described in para.31 steps (7) and (8).
 - (b) Replace the appropriate resistor with a resistance decade box. Adjust the BREAK POINT potentiometer (for that segment of the circuit) and the resistance decade box to achieve the desired frequency accuracy.

Note...

Several resistance decade boxes may have to be used in place of resistors A2R27 to A2R37 since there will usually be an interaction between adjacent circuits.

- (c) Repeat the above step until the total frequency range is aligned and all points fall within the frequency accuracy specification.

Control logic (type 6790A only)

33. Note...

The following adjustments affect frequency calibration of both 0.01-1 GHz and 1-2 GHz bands. After making these adjustments, proceed to para.34.

- (1) Set controls as follows:

SWEEP FUNCTION	CW M1
M1	Low calibrated limit (1.00 GHz)
BANDSWITCH	1 - 2 GHz

- (2) Connect precision voltmeter between A293 (front end) and ground (r.f. unit chassis). The meter should read $+0.328 \text{ V} \pm 0.005 \text{ V}$.
- (3) Set band switch to 0.01-1 GHz and adjust A5R41 so that the voltmeter reads $9.672 \text{ V} \pm 0.005 \text{ V}$.
- (4) Set band switch to 0.01-2 GHz and adjust A5R24 to obtain a reading of $9.672 \text{ V} \pm 0.005 \text{ V}$.
- (5) Move M1 slowly backwards and forwards about the mid-scale point (1.00 GHz on the wide-band markings) and adjust A5R17 so that the front-panel indicators change state at exactly that point.
- (6) Set M1 to the upper calibrated limit (2.00 GHz) and adjust A5R31 for a meter reading of $9.672 \text{ V} \pm 0.005 \text{ V}$.

Additional frequency calibration (type 6790A only)

34. (1) Set band switch to 0.01-1 GHz and leave SWEEP FUNCTION at CW M1.
- (2) Connect a frequency counter to the 6790A RF OUTPUT via a 10 dB pad.
- (3) Plot the frequency error at 50 MHz intervals from 10 MHz to 1 GHz. If necessary, adjust A2R72 to centralize errors in the 100 MHz - 1 GHz region. Errors below 100 MHz can be corrected by adjusting the last variable resistor in use in the shaping network (A2R63 if R37 exists, or R62 if R36 exists and R37 does not, etc.).
- (4) Set band switch to 0.01-2 GHz.
- (5) Plot frequency error at 100 MHz intervals from 10 MHz to 2 GHz. An out-of-specification condition between 10 MHz and 1 GHz can be corrected by adjustment of A5R24 whereas, for the 1-2 GHz region, A5R31 is the relevant adjustment.

Leveller

35. (1) Set controls as follows:-

Front panel

TRIGGER	Auto
SWEEP FUNCTION	F1 - F2
SWEEP TIME (SECS)	0.01
VARIABLE	Fully clockwise
F1	Low end of scale
F2	High end of scale
1 kHz ☐	Off
M1	Mid-scale
M2	High end of scale

Rear panel

RF DURING RETRACE	Off
-------------------	-----

RF unit

LEVELLER MODE	Off
RF LEVEL	Fully clockwise

- (2) Set PWR MTR/XTAL switch, S2, situated near the top front corner of leveller p.c. assembly A1 to the forward (XTAL) position. (See marking on r.f. unit top cover).
- (3) Connect oscilloscope to TP4 on Assembly A1 via a 1 k Ω resistor.
- (4) Adjust R44 so that level observed on oscilloscope is between -5 and -10 mV. Then disconnect oscilloscope.
- (5) Connect equipment as shown in Fig. 18, using no more than 25 cm of coaxial lead between Detector 1 and DET INPUT connector on r.f. unit.
- (6) Depress EXT button of LEVELLER MODE switch to establish external levelling.
- (7) Adjust RF LEVEL control so that the r.f. output is approximately 25% below the level at which it is just levelled across the entire band.
- (8) Set 1 kHz ☐ to ON position.
- (9) Observing the r.f. output displayed on the oscilloscope, adjust R16 for minimum overshoot consistent with fast rise time. This adjustment should result in a rise time within specifications and less than 10% overshoot.
If there is some doubt about this adjustment, switch to Levelling Off and turn RF LEVEL fully clockwise. Turn off 1 kHz ☐ and adjust R16 for +2.15 V at test pin A1TP2.

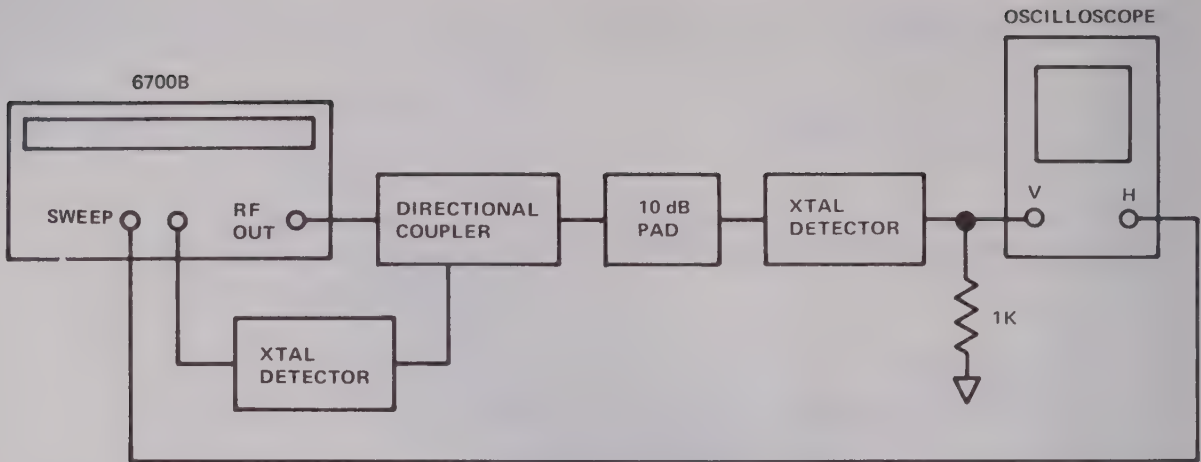


Fig. 18 Levelling calibration test set-up

Chapter 6

REPLACEABLE PARTS

CONTENTS

Para.

- 1 Introduction
- 3 Ordering.

Table

Page

1-1	Assembly reference designations (for r.f. units except 6790A)...	2
1-2	Assembly reference designations (for RF Unit 6790A only) ...	3
1-3	Abbreviations	3
2-1	Model/assembly cross reference	5
2-2	Model/component cross reference	7
3	Basic chassis assembly - varactor-tuned units...	8
4	Basic chassis assembly - YIG-tuned units	8
5	(Not assigned)	
6	Assembly A1 : Leveller (6701/108)	9
7	Assembly A2 : YIG tuning and bias supply, master list (6701/107)	13
7-1	6738A (Avantek) additional parts	18
7-2	6742A (Avantek) " "	19
7-3	6754A (Avantek) " "	20
7-4	6760 (MI) ... " "	20
7-5	6766A (MI) ... " "	21
7-6	6766A (Varian) " "	22
7-7	6770 (MI) ... " "	23
7-8	6774A (MI) ... " "	23
7-9	6774A (Varian) " "	24
8	Assembly A2 : Varactor tuning and bias supply (6701/106) ...	25
9	Assembly A8 : Bias tracking board (6701/110)	30
10	Assembly A9 : Bias switching board (6701/111)	30
11	Assembly A3 : Auxiliary/reference board (6701/109)	30
12	Assembly A4 : Symmetrical sweep width switch (for 6742A, 6754A, 6760A)	31
13	Assembly A4 : Symmetrical sweep width switch (for 6730A, 6790A)	31
14	Assembly A4 : Symmetrical sweep width switch (for 6738A, 6770A)	32
15	Assembly A4 : Symmetrical sweep width switch (for 6766A) ...	32
16	Assembly A4 : Symmetrical sweep width switch (for 6774A) ...	32
17	Assembly A11: Heat exchanger (6701/112)	33
18	Assembly A5 : Control logic board	33

INTRODUCTION

1. This chapter provides information for procuring replaceable parts for the r.f. unit - see Tables 1-1 to 1-3 for a complete explanation of reference designations and abbreviations. Table 2 is a model/assembly cross reference which lists the replaceable parts table applicable to each model of r.f. unit. This table provides the part number of each major assembly and the appropriate table which details all parts of that major assembly.

2. While equivalent alternatives to some components may be included during manufacture, Marconi Instruments Ltd., Sanders Division, should be consulted before any other alternatives are fitted when the equipment is being serviced.

ORDERING

3. Send your order for replacement parts to our Technical Services Department. Specify the following information for each part required.

- (1) Type and serial number of instrument.
- (2) Circuit reference.
- (3) Description.

Marconi Instruments Ltd.,
Sanders Division,
Gunnels Wood Road,
Stevenage SG1 2AU
ENGLAND

Or contact your local Marconi Instruments, Sanders Division representative.

TABLE 1-1 ASSEMBLY REFERENCE DESIGNATIONS
for r.f. units except type 6790A

The reference designations for electrical parts are prefixed with assembly indentifications. These prefixes are identified as follows:-

Assembly	Title
A1	Leveller p.c. board
A2	Tuning and bias supplies p.c. board
A3	Auxiliary/reference supply p.c. board
A4	Symmetrical sweep width switch
A5	Solid state oscillator
A6	Pin diode modulator
A7	Directional coupler
A8	Bias tracking p.c. board
A9	Bias switching p.c. board
A10	Not assigned
A11	Heat exchanger assembly
A12	Crystal detector
A13	Isolator
A14	Low pass filter
*	Basic chassis assembly

*Includes all parts within basic chassis assembly not included in assembly A1-A14.

TABLE 1-2 ASSEMBLY REFERENCE DESIGNATIONS
for r.f. unit type 6790A only

<i>Assembly</i>	<i>Title</i>
A1	Leveller p.c. board
A2	Tuning and bias supplies p.c. board
A3	Not assigned
A4	Symmetrical sweep width switch
A5	Control logic p.c. board
A6	Varactor-tuned oscillator (including buffer amplifier and PIN diode modulator)
A7	Low pass filter/directional detector (1-2 GHz)
A8	Frequency converter
A9	Local oscillator, 2.1 GHz
A10	Low pass filter, 1 GHz
A11	Amplifier 0.01-1 GHz

TABLE 1-3 ABBREVIATIONS

A	: amperes	MIN	: minimum
AMPL	: amplifier	N	: nano = 10^{-9}
AM	: amplitude modulation	NC	: normally closed
APPROX	: approximate	NEG	: negative
ASS'Y	: assembly	NO	: normally open
AUX	: auxiliary	Ω	: ohm
AVG	: average	PC	: printed circuit
BAL	: balance	pF	: picofarad = 10^{-12} farad
dB	: decibel	P/O	: part of
dBm	: decibel (referred to 1 milliwatt)	P-P	: peak-to-peak
EXT	: external	RECT	: rectifier
F	: farad	RES	: resistance or resistor
FIG	: figure	RET	: return
FM	: frequency modulation	REV	: reverse
G	: giga = 10^9	RF	: radio frequency
GND	: ground	RMS	: square root of mean square
H	: henry	SEC	: second
Hz	: cycle per second	SW	: switch
INT	: internal	SYM	: symmetrical
J	: jack (socket)	TRIG	: trigger
K	: kilo = 10^3	TYP	: typical
LIN	: linear	μ	: micro = 10^{-6}
M	: milli = 10^{-3}	V	: volt
MAX	: maximum	VAR	: variable
MEG	: meg = 10^6		

TABLE 2-2 MODEL/COMPONENT CROSS REFERENCE
(Components mounted on chassis
or on oscillators)

RF unit type	Transistor Q1	Transistor Q2	Resistor R5	Resistor R6	Resistor R7	Zener diode CR1	Zener diode CR2
6730A (MI)	MJ 1000	-	-	15Ω, 5%, 25W	-	BZX70-C22	-
6738A (AV)	MJ 900	MJ 1000	34.8Ω, 1%, 25W	15Ω, 5%, 25W	-	BZX70-C16	-
6742A (AV)	MJ 900	MJ 1000	34.8Ω, 1%, 25W	15Ω, 5%, 25W	-	BZX70-C16	-
6754A (AV)	MJ 900	MJ 1000	15Ω, 1%, 25W	15Ω, 5%, 25W	-	BZX70-C16	ZPY 5.1
6760A (MI)	MJ 1000	MJ 1000	10Ω, 1%, 50W	15Ω, 5%, 25W	8Ω, 5%, 25W	*	-
6766A (MI)	MJ 1000	MJ 1000	10Ω, 1%, 50W	15Ω, 5%, 25W	8Ω, 5%, 25W	*	-
6766A (VA)	MJ 900	MJ 1000	10Ω, 1%, 50W	15Ω, 5%, 25W	8Ω, 5%, 25W	*	-
6770A (MI)	MJ 1000	MJ 1000	10Ω, 1%, 50W	15Ω, 5%, 25W	8Ω, 5%, 25W	*	-
6774A (MI)	MJ 1000	MJ 1000	6.8Ω, 1%, 50W	15Ω, 5%, 25W	6Ω, 5%, 25W	*	-
6744A (VA)	MJ 900	MJ 1000	6.8Ω, 1%, 50W	15Ω, 5%, 25W	6Ω, 5%, 25W	*	-
6790A	MJ 1000	-	-	15Ω, 5%, 25W	-	-	-

*Selected at test

Circuit ref.	Description	Mfg. & type
R1	Res. var., 1k Ω 10% 1W	Allen-Bradley MI Drg. 6701/208
R2	Not used	
R3	Not used	
R4	Res. var., 1k Ω 10% $\frac{1}{2}$ W	Allen Bradley YN102U
R5	Not used	
R6	Res., 15 Ω 5% 25W	CGS HSA 25
S1	Switch, toggle SPDT	MI 23462-258L
*S2	Switch, lever 2P4T	Lorlin Elect. LRA

* Items used in type 6790A only.

Table 4. Basic chassis assembly - YIG-tuned units

A1	See Table 2
A2	See Table 2
A3	See Table 2
A4	See Table 2
A5	See Table 2
A6	See Table 2
A7	See Table 2
A8	See Table 2
A9	See Table 2
A10	See Table 2

Circuit ref.	Description	Mfg. & type
-----------------	-------------	-------------

Table 3. Basic chassis assembly - varactor-tuned units

A1	See Table 2	
A2	See Table 2	
A3	See Table 2	
A4	See Table 2	
A5	See Table 2	
A6	See Table 2	
A7	See Table 2	
A8	See Table 2	
A9	See Table 2	
A10	See Table 2	
A11	See Table 2	
A12	See Table 2	
A13	See Table 2	
A14	See Table 2	
DS1,DS2	Solid state lamp	Arcoelectric SL42/Red
*DS3,DS4	Solid state lamp	Arcoelectric SL42/Red
J1	Receptacle, 10-pin	Pye-Ether M-10S-LR-LW-N
J2	Connector, BNC	Greenpar GE 35063/BN
J3	Connector, BNC	Greenpar GE 35063/BN
J4	Not used	
J5	Connector, BNC	Greenpar GE 35063/BN
P1	Plug, 36-pin	Amphenol 57-10360
Q1	See Table 2-2	

Circuit ref.	Description	Mfr. & type	Circuit ref.	Description	Mfr. & type
Table 4 (contd.)					
A11	See Table 2		S1	Switch, toggle SPDT	MI 23462-258L
A12	See Table 2		Table 6. Assembly A1 : Leveller (6701/108)		
A13	See Table 2		A1C1	Cap. 56pF 10% 200V	Vitramon CK05BX560K
A14	See Table 2		A1C2	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K
CR1	See Table 2-2		A1C3	Factory selected	
			A1C4	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K
CR2	See Table 2-2		A1C5	Cap. 2200pF 10% 200V	Vitramon CK06BX222K
DS1	Solid state lamp	Arcoelectric SL42/Red	A1C6	Cap. 82pF 10% 200V	Vitramon CK05BX820K
DS2	Solid state lamp	Arcoelectric SL42/Red	A1C7	Cap. 56pF 10% 200V	Vitramon CK05BX560K
J1	Receptacle, 10-pin	Pye-ether M-10S-LR-LW-N	A1C8	Cap. 100pF 10% 200V	Vitramon CK05BX101K
J2	Connector, BNC	Greenpar GE 35063/BN	A1C9	Cap. 220pF 10% 200V	Vitramon CK05BX221K
J3	Connector, BNC	Greenpar GE 35063/BN	A1C10	Cap. 3.3pF ±0.5pF 250V	Erie Type 861
J4	Not used				
J5	Connector, BNC	Greenpar GE 35063/BN	A1C11	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K
P1	Plug, 36-pin	Amphenol 57-10360	A1C12	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K
Q1	See Table 2-2		A1C13	Cap. 56pF 10% 200V	Vitramon CK05BX560K
Q2	See Table 2-2		A1C14	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K
R1	Res. var., 1kΩ 10% 1W	Allen-Bradley M.I. Drg. 6701/208	A1C15	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K
R2	Not used		A1C16	Cap. 1000pF 10% 200V	Vitramon CK05BX102K
R3	Not used		A1C17	Cap. 2200pF 10% 200V	Vitramon CK06BX222K
R4	Res. var., 1kΩ 10% 1/4W	Allen-Bradley YN 102U	A1C18	Cap. 470pF 10% 200V	Vitramon CK05BX471K
R5	See Table 2-2		A1C19	Cap. 100pF 10% 200V	Vitramon CK05BX101K
R6	Res., 15Ω 5% 25W	CGS HSA 25	A1C20	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K
			A1C21	Cap. tant., 10μF 20% 35V	ITT TAG 10/35

Circuit ref.	Description	Mfr. & type	Circuit ref.	Description	Mfr. & type
Table 6 (contd.)					
A1C22	Cap. tant., 10 μ F 20% 35V	ITT TAG 10/35	A1CR18	Diode zener 5% 5.1V	Mullard BZY88-C5V1
A1C23	Cap. 220pF 10% 200V	Vitramon CK05BX221K	A11C1	Operational amp.	Fairchild 715DC
A1C24	Cap. tant., 1.0 μ F 20% 35V	ITT TAG 1.0/35	A11C2	Operational amp.	Fairchild 715DC
A1C25	Cap. 0.1 μ F 10% 100V	Vitramon CK06BX104K	A11C3	Quad nand gate	Motorola MC846P
A1C26	Cap. tant., 1.0 μ F 20% 35V	ITT TAG 1.0/35	A11C4	Operational amp.	Motorola MC1458P
A1C27	Cap. 0.1 μ F 10% 100V	Vitramon CK06BX104K	A1K1	Relay, DPDT	Potter & Brumfield JRM1049
A1C28	Cap. 2.2 μ F 20% 50V	Sprague 7G023	A1Q1	Transistor	Motorola 2N4401
A1CR1	Diode rect.	Mullard IN4148	A1Q2	Transistor	Motorola 2N4401
A1CR2	Diode rect.	Mullard IN4148	A1Q3	Transistor	Motorola 2N4403
A1CR3	Diode rect.	Mullard IN4148	A1Q4	Transistor	Motorola 2N4401
A1CR4	Diode rect.	Mullard IN4148	A1Q5	Transistor	Motorola 2N4403
A1CR5	Diode rect.	Mullard IN4148	A1Q6	Transistor	Motorola 2N4401
A1CR6	Diode rect.	Mullard IN4148	A1Q7	Transistor	Motorola 2N4401
A1CR7	Diode rect.	Mullard IN4148	A1Q8	Transistor	Motorola 2N4401
A1CR8	Diode rect.	Mullard IN4148	A1Q9	Transistor	Motorola 2N4401
A1CR9	Diode rect.	Mullard IN4148	A1Q10	Transistor	Motorola 2N4403
A1CR10	Diode rect.	Mullard IN4148	A1Q11	Transistor	Motorola 2N4401
A1CR11	Diode rect.	Mullard IN4148	A1Q12	Transistor	Motorola 2N4401
A1CR12	Diode rect.	Mullard IN4148	A1Q13	Transistor	Motorola 2N4403
A1CR13	Diode rect.	Mullard IN4148	A1Q14	Transistor	Motorola 2N4401
A1CR14	Diode rect.	Mullard IN4148	A1Q15	Transistor	Motorola 2N4403
A1CR15	Diode rect.	Mullard IN4148	A1Q16	Transistor	Motorola 2N4403
A1CR16	Diode rect.	Mullard IN4148	A1Q17	Transistor	Motorola 2N4401
A1CR17	Diode zener 5% 5.1V	Mullard BZY88-C5V1	A1Q18	FET	Motorola 2N4092
			A1Q19	Transistor	Motorola 2N4401

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
Table 6 (contd.)					
A1Q20	Transistor	Motorola 2N4401	A1R21	Res. 4.7k Ω 2% 0.25W	Mullard MR25
A1Q21	Transistor	Motorola 2N4401	A1R22	Res. 1.8k Ω 2% 0.25W	Mullard MR25
A1Q22	Transistor	Motorola 2N4401	A1R23	Res. 1.47k Ω 1% 1/8W	Holco H8/50
A1Q23	Transistor	Motorola 2N4401	A1R24	Res. 560 Ω 2% 0.25W	Mullard MR25
A1R1	Res. 3.3k Ω 2% 0.25W	Mullard MR25	A1R25	Res. 1k Ω 2% 0.25W	Mullard MR25
A1R2	Res. 845 Ω 1% 1/8W	Holco H8/50	A1R26	Res. 3k Ω 2% 0.25W	Mullard MR25
A1R3	Res. 150 Ω 2% 0.25W	Mullard MR25	A1R27	Factory selected	
A1R4	Res. 820 Ω 2% 0.25W	Mullard MR25	A1R28	Res. 33k Ω 2% 0.25W	Mullard MR25
A1R5	Res. 1.8k Ω 2% 0.25W	Mullard MR25	A1R29	Res. 15k Ω 2% 0.25W	Mullard MR25
A1R6	Res. 220 Ω 2% 0.25W	Mullard MR25	A1R30	Res. 3.3k Ω 2% 0.25W	Mullard MR25
A1R7	Res. 100 Ω 2% 0.25W	Mullard MR25	A1R31	Res. 150 Ω 2% 0.25W	Mullard MR25
A1R8	Res. 15k Ω 2% 0.25W	Mullard MR25	A1R32	Res. 2.2k Ω 2% 0.25W	Mullard MR25
A1R9	Res. 2.15k Ω 1% 1/8W	Holco H8/50	A1R33	Res. 33k Ω 2% 0.25W	Mullard MR25
A1R10	Res. 330 Ω 2% 0.5W	Mullard MR30	A1R34	Res. 5.6k Ω 2% 0.25W	Mullard MR25
A1R11	Res. 3.3k Ω 2% 0.25W	Mullard MR25	A1R35	Res. 1.5k Ω 2% 0.25W	Mullard MR25
A1R12	Res. 220 Ω 2% 0.25W	Mullard MR25	A1R36	Res. 1.5k Ω 2% 0.25W	Mullard MR25
A1R13	Res. 200 Ω 2% 0.5W	Mullard MR30	A1R37	Res. 33k Ω 2% 0.25W	Mullard MR25
A1R14	Res. 100 Ω 2% 0.25W	Mullard MR25	A1R38	Res. 5.6k Ω 2% 0.25W	Mullard MR25
A1R15	Res. 1k Ω 2% 0.25W	Mullard MR25	A1R39	Res. 10k Ω 2% 0.25W	Mullard MR25
A1R16	Res. var. 500 Ω 10% 0.3W	Spectrol-Reliance 43P	A1R40	Res. 330k Ω 5% 1/8W	Mullard CR25
A1R17	Res. 4.7k Ω 2% 0.25W	Mullard MR25	A1R41	Res. 100k Ω 2% 0.25W	Mullard MR25
A1R18	Res. 1k Ω 2% 0.25W	Mullard MR25	A1R42	Res. 2.2k Ω 2% 0.25W	Mullard MR25
A1R19	Res. 1.5k Ω 2% 0.25W	Mullard MR25	A1R43	Res. 4.7k Ω 2% 0.25W (6790A, 6730A, 6742A)	Mullard MR25
A1R20	Res. 6.04k Ω 1% 1/8W	Holco H8/50			

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
<u>Table 6 (contd.)</u>					
A1R43	Res. 10k Ω 2% 0.25W (6738A, 6754A, 6774A)	Mullard MR25	A1R58	Res. 47 Ω 2% 0.25W	Mullard MR25
A1R43	Res. 6.8k Ω 2% 0.25W (6760A, 6766A, 6770A)	Mullard MR25	A1R59	Res. 150 Ω 2% 0.25W	Mullard MR25
A1R44	Res. Var., 50k Ω 10% 0.3W	Spectrol-Reliance 43P	A1R60	Res. 2.2k Ω 2% 0.25W	Mullard MR25
A1R45	Res. 1k Ω 2% 0.25W	Mullard MR25	A1R61	Res. 3.3k Ω 2% 0.25W	Mullard MR25
A1R46	Res. 1k Ω 2% 0.25W	Mullard MR25	A1R62	Res. 10k Ω 2% 0.25W	Mullard MR25
A1R47	Res. 51k Ω 2% 0.25W	Mullard MR25	A1R63	Res. 10k Ω 2% 0.25W	Mullard MR25
A1R48	Res. 10k Ω 2% 0.25W	Mullard MR25	A1R64	Res. 56k Ω 2% 0.25W	Mullard MR25
A1R49	Res. 5.6k Ω 2% 0.25W	Mullard MR25	A1R65	Res. 150k Ω 2% 0.25W	Mullard MR25
A1R50	Res. 2.2k Ω 2% 0.25W	Mullard MR25	A1R66	Res. 1.5k Ω 2% 0.25W	Mullard MR25
A1R51	Res. 4.7k Ω 2% 0.25W (6730A, 6790A)	Mullard MR25	A1R67	Res. 3.3k Ω 2% 0.25W	Mullard MR25
A1R51	Res. 6.8k Ω 2% 0.25W (6738A, 6742A, 6754A)	Mullard MR25	A1R68	Res. 2.2k Ω 2% 0.25W	Mullard MR25
A1R51	Res. 3.3k Ω 2% 0.25W (6760A, 6766A, 6770A, 6774A)	Mullard MR25	A1R69	Res. 100k Ω 2% 0.25W	Mullard MR25
A1R52	Res. 150 Ω 2% 0.25W	Mullard MR25	A1R70	Res. 4.7k Ω 2% 0.25W	Mullard MR25
A1R53	Res. 150 Ω 2% 0.25W	Mullard MR25	A1R71	Res. 2.2k Ω 2% 0.25W	Mullard MR25
A1R54	Res. 150 Ω 2% 0.25W	Mullard MR25	A1R72	Res. 10k Ω 2% 0.25W	Mullard MR25
A1R55	Res. 150 Ω 2% 0.25W	Mullard MR25	A1R73	Res. 27k Ω 2% 0.25W	Mullard MR25
A1R56	Res. 150 Ω 2% 0.25W	Mullard MR25	A1R74	Res. 5.6k Ω 2% 0.25W	Mullard MR25
A1R57	Res. 10 Ω 2% 0.25W	Mullard MR25	A1S1	Switch, push-button	Lipa & Isostat MI. Drg. 6701/207
			A1S2	Switch, slide	Alco MSS-2250R

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
Table 7. Assembly A2 : YIG tuning & bias supply					
Note....					
Table 7 represents a master parts list for Assembly A2. Cross reference should be made between Tables 2 and 7-1 to 7-9 for parts which are specific to individual types of r.f. unit.					
A2C1	See specific list		A2C19	Cap. 150pF 10% 200V	Vitramon CK05BX151K
A2C2	Cap. 150pF 10% 200V	Vitramon CK05BX151K	A2C20	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K
A2C3	Cap. 0.01μF 10% 200V	Vitramon CK06BX103K	A2C21	Cap. 0.47μF 20% 50V	Vitramon VK33BW474M
A2C4	Cap. 0.01μF 10% 200V	Vitramon CK06BX103K	A2C22	Cap. 0.33μF 20% 50V	Vitramon VK33BW334M
A2C5	See specific list		A2C23	Cap. 1000pF 10% 200V	Vitramon CK05BX102K
A2C6	Cap. 0.047μF 10% 100V	Vitramon CK06BX473K	A2C24	Cap. 1000pF 10% 200V	Vitramon CK05BX102K
A2C7	Cap. 4700pF 10% 200V	Vitramon CK06BX472K	A2C25	Cap. 0.047μF 10% 100V	Vitramon CK06BX473K
A2C8	Cap. 0.01μF 10% 200V	Vitramon CK06BX103K	A2C26	Cap. 470pF 10% 200V	Vitramon CK05BX471K
A2C9	Cap. 0.01μF 10% 200V	Vitramon CK06BX103K	A2C27	Cap. 2.2μF 20% 50V	Sprague 7C-023
A2C10	Cap. 3300pF 10% 200V	Vitramon CK06BX332K	A2C28	Cap. 0.01μF 10% 200V	Vitramon CK06BX103K
A2C11	Cap. 0.022μF 10% 100V	Vitramon CK06BX223K	A2C29	See specific list	ITT TAG10/35
A2C12	Cap. 4700pF 10% 200V	Vitramon CK06BX472K	A2C30	Cap. Tant., 10μF 10% 35V	
A2C13	Cap. 3300pF 10% 200V	Vitramon CK06BX332K	A2C31	Cap. 0.47μF 20% 50V	Vitramon VK33BW474M
A2C14	See specific list		A2C32	Cap. 0.01μF 10% 200V	Vitramon CK06BX103K
A2C15	Cap. 0.22μF 20% 50V	Vitramon VK33BW224M	A2C33	Cap. 680pF 10% 200V	Vitramon CK05BX681K
A2C16	See specific list		A2C34	Cap. 10pF 10% 200V	Vitramon CK05BX100K
A2C17	Cap. 68pF 10% 200V	Vitramon CK05BX680K	A2C35	Cap. 10pF 10% 200V	Vitramon CK05BX100K
A2C18	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K	A2CR1	Diode, rect.	Mullard IN4148
			A2CR2	Diode, rect.	Mullard IN4148
			A2CR3	Diode, rect.	Mullard IN4148
			A2CR4	Diode, rect.	Mullard IN4148
			A2CR5	Diode, rect.	Mullard IN4148
			A2CR6	Diode, zener 5% 4.7V	Mullard BZY88-C4V7
			A2CR7	SCR	Motorola 2N4441
			A2CR8	Diode, rect.	Mullard IN4003

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
<u>Table 7 (contd.)</u>					
A2CR9	Diode, rect.	Mullard IN4148	A2CR31	Diode, rect.	Mullard IN4148
A2CR10	Diode, rect.		A2CR32	Diode, rect.	Mullard IN4148
A2CR11	Diode, rect.	Mullard IN4148	A2CR33	Diode, rect.	Mullard IN4148
A2CR12	Diode, rect.		A2CR34	Diode, rect.	Mullard IN4148
A2CR13	Diode, zener 5% 15V	Mullard IN4148	A2CR35	Diode, zener 5% 8.2V	Mullard BZY88-C8V2
A2CR14	Diode, rect.				
A2CR15	Diode, rect.	Mullard IN4148	A2CR36	Diode, rect.	Mullard IN4148
A2CR16	Diode, rect.		A2CR37	Diode, rect.	Mullard IN4148
A2CR17	Diode, rect.	Mullard IN4148	A2CR38	Diode, rect.	Mullard IN4148
A2CR18	Diode, rect.		A2CR39	Diode, rect.	Mullard IN4148
A2CR19	Diode, rect.	Mullard IN4148	A2CR40	Diode, rect.	Mullard IN4148
A2CR20	Diode, rect.				
A2CR21	Diode, rect.	Mullard IN4148	A2CR41	Diode, rect.	Mullard IN4148
A2CR22	Diode, rect.		A2CR42	Diode, rect.	Mullard IN4148
A2CR23	Diode, rect.	Mullard IN4148	A2CR43	Diode, rect.	Mullard IN4148
A2CR24	Diode, rect.		A2CR44	Diode, rect.	Mullard IN4148
A2CR25	Diode, rect.	Mullard IN4148	A2CR45	Diode, rect.	Mullard IN4148
A2CR26	Diode, rect.				
A2CR27	Diode, rect.	Mullard IN4148	A2CR46	See specific list	
A2CR28	Diode, rect.		A2CR47	See specific list	
A2CR29	Diode, rect.	Mullard IN4148	A2CR48	Diode, rect.	Mullard IN4148
A2CR30	Diode, rect.		A2CR49	Not used	
			A2CR50	Diode, germanium	Transitron IN270
			A2CR51	Diode, rect.	Mullard IN4148
			A2F1	See specific list	
			A2F2	See specific list	
			A21C1	Operational amp.	National LM301AH
			A21C2	Operational amp.	National LM301AH

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
Table 7 (contd.)					
A21C3	Operational amp.	National LM301AH	A2Q18	Transistor	Motorola 2N4403
A21C4	Dual op. amp.	Motorola MC1458P	A2Q19	See specific list	
A21C5	Dual op. amp.	Motorola MC1458P	A2R1	Res. 33 Ω 2% 0.25W	Mullard MR25
A21C6	Dual op. amp.	Motorola MC1458P	A2R2	See specific list	
A21C7	Dual op. amp.	Motorola MC1458P	A2R3	See specific list	
			A2R4	Res. 180 Ω 2% 0.25W	Mullard MR25
A21C8	Transistor array	RCA CA3046	A2R5	Not used	
A2K1	Relay, reed	MI 6700/277	A2R6	Res. 15k Ω 2% 0.25W	Mullard MR25
A2Q1	See specific list		A2R7	Res. 22k Ω 2% 0.25W	Mullard MR25
A2Q2	Transistor	Motorola 2N4401	A2R8	See specific list	
A2Q3	Transistor	Motorola 2N4403	A2R9	Res. 1.96k Ω 1% 1/8W	Holco H8/50
A2Q4	Transistor	Motorola MPSU55	A2R10	See specific list	
A2Q5	Transistor	Motorola 2N4401	A2R11	Res. 1.96k Ω 1% 1/8W	Holco H8/50
A2Q6	Transistor	Motorola 2N4403	A2R12	Res. 2.2k Ω 2% 0.25W	Mullard MR25
A2Q7	Transistor	Motorola 2N4403	A2R13	Res. 220 Ω 2% 0.25W	Mullard MR25
A2Q8	Transistor, dual	Motorola 2N2919	A2R14	Res. 470 Ω 2% 0.25W	Mullard MR30
A2Q9	Transistor, dual	Motorola 2N2919	A2R15	Res. 470 Ω 2% 0.25W	Mullard MR25
A2Q10	Transistor	Motorola 2N4403	A2R16	Res. 220 Ω 2% 0.25W	Mullard MR25
A2Q11	Transistor	Motorola MPSU05	A2R17	See specific list	
A2Q12	Transistor	Motorola MPSU55	A2R18	Res. var. 2k Ω 10% 0.3W	Spectrol-Reliance 43P
A2Q13	Not used		A2R19	Res. 12.1k Ω 1% 1/8W	Holco H8/50
A2Q14	Transistor	Motorola 2N4401	A2R20	Res. 1k Ω 2% 0.25W	Mullard MR25
A2Q15	Transistor	Motorola 2N4401	A2R21	Res. 470 Ω 2% 0.25W	Mullard MR25
A2Q16	FET	Motorola 2N4092	A2R22	See specific list	
A2Q17	Transistor	Motorola 2N4403	A2R23	Res. 680 Ω 2% 0.25W	Mullard MR25

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
<u>Table 7 (contd.)</u>					
A2R24	Res. 1.8k Ω 2% 0.5W	Mullard MR30	A2R47	Res. 10 Ω 2% 0.25W	Mullard MR25
A2R25	See specific list		A2R48	Res. 2.2k Ω 2% 0.25W	Mullard MR25
A2R26	Res. 51k Ω 2% 0.25W	Mullard MR25	A2R49	Res. 100 Ω 10% 1W	Allen-Bradley GB
A2R27	Res. 51k Ω 2% 0.25W	Mullard MR25			
A2R28	Res. 10.0k Ω 1% 1/8W	Holco H8/50	A2R50	Res. var., 500k Ω 10% 0.3W	Spectrol-Reliance 43P
A2R29	Res. 10.0k Ω 1% 1/8W	Holco H8/25	A2R51	See specific list	
			A2R52	See specific list	
			S2R53	Res. 4.7k Ω 2% 0.25W	Mullard MR25
			A2R54	Res. 475k Ω 1% 1/8W	Holco H8/50
A2R30	See specific list		A2R55	Res. 475k Ω 1% 1/8W	Holco H8/50
A2R31	See specific list		A2R56	Res. 330k Ω 5% 1/8W	Mullard CR25
A2R32	Res. 1.00M 1% 1/8W	ERG EE-0.125-1.0M-F-C2	A2R57	Res. 56k Ω 2% 0.25W	Mullard MR25
A2R33	Res. 1.00M 1% 1/8W	ERG EE-0.125-1.0M-F-C2	A2R58	Res. 2.2k Ω 2% 0.25W	Mullard MR25
A2R34	Res. 750k Ω 1% 1/8W	ERG EE-0.125-750K-F-C2	A2R59	Res. 150k Ω 2% 0.25W	Mullard MR25
A2R35	Res. 1.30k Ω 1% 1/8W	Holco H8/50	A2R60	Res. 390 Ω 2% 0.25W	Mullard MR25
A2R36	Res. 5.1k Ω 2% 0.25W	Mullard MR25	A2R61	See specific list	
A2R37	Res. 2k Ω 2% 0.25W	Mullard MR25	A2R62	Res. 220 Ω 2% 0.25W	Mullard MR25
A2R38	Res. 3.3k Ω 2% 0.25W	Mullard MR25	A2R63	Res. 2.43k Ω 0.1% 1/8W	Holco H8/25
A2R39	Res. 3.3k Ω 2% 0.25W	Mullard MR25	A2R64	Res. 2.43k Ω 0.1% 1/8W	Holco H8/25
A2R40	Res. 10k Ω 2% 0.25W	Mullard MR25	A2R65	Res. 100 Ω 0.1% 1/8W	Holco H8/25
A2R41	Res. 15k Ω 2% 0.25W	Mullard MR25	A2R66	Res. 100 Ω 0.1% 1/8W	Holco H8/25
A2R42	Res. 200 Ω 2% 0.25W	Mullard MR25	A2R67	Res. 220 Ω 2% 0.25W	Mullard MR25
A2R43	Res. 10k Ω 2% 0.25W	Mullard MR25	A2R68	Res. 1.5k Ω 2% 0.25W	Mullard MR25
A2R44	Res. 150 Ω 2% 0.25W	Mullard MR25	A2R69	Res. 243k Ω 0.1% 1/8W	Holco H8/25
A2R45	Res. 100 Ω 10% 1W	Allen-Bradley GB	A2R70	Res. 243k Ω 0.1% 1/8W	Holco H8/25
A2R46	Res. 10 Ω 2% 0.25W	Mullard MR25	A2R71	Res. 470 Ω 2% 0.25W	Mullard MR25

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
Table 7 (contd.)					
A2R72	Res. 820Ω 2% 0.25W	Mullard MR25	A2R95	Res. 20kΩ 2% 0.25W	Mullard MR25
A2R73	Res. 2.2kΩ 2% 0.25W	Mullard MR25	A2R96	Res. 4.7kΩ 2% 0.25W	Mullard MR25
A2R74	Res. 150kΩ 2% 0.25W	Mullard MR25	A2R97	Res. 475kΩ 1% 1/8W	Holco H8/50
A2R75	Res. 1.8M 10% 1/8W	Mullard CR25	A2R98	Res. 475kΩ 1% 1/8W	Holco H8/50
A2R76	Res. 390Ω 2% 0.25W	Mullard MR25	A2R99	Res. 20kΩ 2% 0.25W	Mullard MR25
A2R77	Res. 910Ω 2% 0.5W	Mullard MR30	A2R100	Res. 10kΩ 2% 0.25W	Mullard MR25
A2R78	Res. 1kΩ 2% 0.25W	Mullard MR25	A2R101	Res. 120kΩ 2% 0.25W	Mullard MR25
A2R79	Res. 221kΩ 1% 1/8W	Holco H8/50	A2R102	Res. 6.8kΩ 2% 0.25W	Mullard MR25
A2R80	Res. 221kΩ 1% 1/8W	Holco H8/50	A2R103	Res. 220Ω 2% 0.25W	Mullard MR25
A2R81	Res. 39kΩ 2% 0.25W	Mullard MR25	A2R104	See specific list	
A2R82	Res. 51kΩ 2% 0.25W	Mullard MR25	A2R105	See specific list	
A2R83	Res. 68.1kΩ 1% 1/8W	Holco H8/50	A2R106	Res. 2.2M 10% 1/8W	Mullard CR25
A2R84	Res. 68.1kΩ 1% 1/8W	Holco H8/50	*A2R107	Res. 150kΩ 1% 1/8W	Holco H8/50
A2R85	See specific list		A2R108	Res. var., 200kΩ 10% 0.3W	Spectrol-Reliance 43P
A2R86	Res. 121kΩ 1% 1/8W	Holco H8/50	A2R109	Res. 47kΩ 2% 0.25W	Mullard MR25
A2R87	Res. var., 100kΩ 10% 0.3W	Spectrol-Reliance 43P	A2R110	Res. 330kΩ 5% 1/8W	Mullard CR25
A2R88	See specific list		A2R111	Res. 68kΩ 2% 0.25W	Mullard MR25
A2R89	Res. var., 200kΩ 10% 0.3W	Spectrol-Reliance 43P	A2R112	Res. 22kΩ 2% 0.25W	Mullard MR25
A2R90	Res. 33kΩ 2% 0.25W	Mullard MR25	A2R113	Res. 100kΩ 2% 0.25W	Mullard MR25
A2R91	Res. 1.8kΩ 2% 0.25W	Mullard MR25	A2R114	Res. 7.5kΩ 2% 0.25W	Mullard MR25
A2R92	Res. 10M 10% 1/8W	Mullard CR25	A2R115	Res. 22kΩ 2% 0.25W	Mullard MR25
A2R93	Res. 20kΩ 2% 0.25W	Mullard MR25	A2R116	Res. 22kΩ 2% 0.25W	Mullard MR25
A2R94	Res. 10kΩ 2% 0.25W	Mullard MR25	A2R117	Res. 22kΩ 2% 0.25W	Mullard MR25
			A2R118	Res. 10kΩ 2% 0.25W	Mullard MR25
			A2R119	Res. 560kΩ 5% 1/8W	Mullard CR25

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
Table 7 (contd.)					
A2R120	Res. 1.5k Ω 2% 0.25W	Mullard MR25	A2	Basic YIG tuning and bias supply assembly (See Table 7)	
A2R121	Res. 3.3k Ω 2% 0.25W	Mullard MR25	A2C1	Cap. 2200pF 10% 200V	Vitramon CK06BX222K
A2R122	Res. 3.3k Ω 2% 0.25W	Mullard MR25	A2C5	Cap. 10 μ F 10% 35V	ITT TAG 10/35
A2R123	Res. 39k Ω 2% 0.25W	Mullard MR25	A2C14	Cap. 0.01 μ F 10% 200V	Vitramon CK06BX103K
A2R124	Res. 470 Ω 2% 0.25W	Mullard MR25	A2C16	Cap. 2200pF 10% 200V	Vitramon CK06BX222K
A2R125	Not used		A2C29	Cap. 4700pF 10% 200V	Vitramon CK06BX472K
A2R126	Not used		A2CR46	Diode, zener 24V	Mullard BZY88-C24
A2R127	Not used		A2CR47	Diode, zener 5.1V	ITT ZPY 5.1
A2R128	Not used		A2F1	Fuse link 1A	20mm x 5mm
A2R129	See specific list		A2F2	Fuse link 500mA	20mm x 5mm
A2R130	See specific list		A2Q1	Transistor	Motorola 2N4403
A2R131	Res. 1.8k Ω 2% 0.25W	Mullard MR25	A2Q19	Transistor	Motorola 2N4403
A2R132	Res. 7.5k Ω 2% 0.25W	Mullard MR25	A2R2	Res. 0.75 Ω 5% 3W	CGS C3A
A2R133	Res. 47k Ω 2% 0.25W	Mullard MR25	A2R3	Res. 1.8k Ω 2% 0.5W	Mullard MR30
A2R134	See specific list		A2R8	Factory selected	
A2R135	Not used		A2R10	Factory selected	
A2R136	Not used		A2R17	Not used	
A2R137	Res. 1.8M 10% 1/8W	Mullard CR25	A2R22	Res. 8.2 Ω 5% 3W	CGS C3A
A2R138	Res. 10.0k Ω 1% 1/8W	Holco H8/50	A2R25	Res. 3.9k Ω 2% 0.25W	Mullard MR25
A2R139	See specific list				
A2R140	Res. 100k Ω 2% 0.25W	Mullard MR25			
A2TP1-14	Quick disconnect pin	Cambion 2970-2			
	Fuse-holders	Bulgin F267			

* A2R107 is 100k Ω in type 6738A and 330k Ω in type 6760A

Table 7-1. Assembly A2-6738A (Avantek) : YIG tuning and bias supply

A2	Basic YIG tuning and bias supply assembly (See Table 7)	
A2C1	Cap. 2200pF 10% 200V	Vitramon CK06BX222K
A2C5	Cap. 10 μ F 10% 35V	ITT TAG 10/35
A2C14	Cap. 0.01 μ F 10% 200V	Vitramon CK06BX103K
A2C16	Cap. 2200pF 10% 200V	Vitramon CK06BX222K
A2C29	Cap. 4700pF 10% 200V	Vitramon CK06BX472K
A2CR46	Diode, zener 24V	Mullard BZY88-C24
A2CR47	Diode, zener 5.1V	ITT ZPY 5.1
A2F1	Fuse link 1A	20mm x 5mm
A2F2	Fuse link 500mA	20mm x 5mm
A2Q1	Transistor	Motorola 2N4403
A2Q19	Transistor	Motorola 2N4403
A2R2	Res. 0.75 Ω 5% 3W	CGS C3A
A2R3	Res. 1.8k Ω 2% 0.5W	Mullard MR30
A2R8	Factory selected	
A2R10	Factory selected	
A2R17	Not used	
A2R22	Res. 8.2 Ω 5% 3W	CGS C3A
A2R25	Res. 3.9k Ω 2% 0.25W	Mullard MR25

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
Table 7-1 (contd.)					
A2R30	Factory selected		A2C29	Cap. 4700pF 10% 200V	Vitramon CK06BX472K
A2R31	Res. var., 2k Ω 10% 0.3W		A2CR46	Diode, zener 24V	Mullard BZY88-C24
A2R51	Res. 51k Ω 2% 0.25W		A2CR47	Diode, zener 5.1V	ITT ZPY 5.1
A2R52	Res. 69.8k Ω 1% 1/8W		A2F1	Fuse 1ink 1A	20mm x 5mm
A2R61	Res. 100k Ω 2% 0.25W		A2F2	Fuse 1ink 500mA	20mm x 5mm
A2R85	Res. 22 Ω 2% 0.5W		A2Q1	Transistor	Motorola 2N4403
A2R88	Res. 270k Ω 2% 0.25W		A2Q19	Transistor	Motorola 2N4403
A2R104	Res. var., 500 Ω 10% 0.3W		A2R2	Res. 0.75 Ω 5% 3W	CGS C3A
A2R105	Factory selected		A2R3	Res. 1.8k Ω 2% 0.5W	Mullard MR30
A2R129	Res. 348k Ω 1% 1/8W		A2R8	Factory selected	
A2R130	Res. 348k Ω 1% 1/8W		A2R10	Factory selected	
A2R139	Not used		A2R17	Not used	
			A2R22	Res. 8.2 Ω 5% 3W	CGS C3A
			A2R25	Res. 3.9k Ω 2% 0.25W	Mullard MR25
			A2R30	Factory selected	
			A2R31	Res. var., 2k Ω 10% 0.3W	Spectrol-Reliance 43P
			A2R51	Res. 51k Ω 2% 0.25W	Mullard MR25
			A2R52	Res. 69.8k Ω 1% 1/8W	Holco H8/50
			A2R61	Res. 100k Ω 2% 0.25W	Mullard MR25
			A2R85	Res. 22 Ω 2% 0.5W	Mullard MR30
			A2R88	Res. 270k Ω 2% 0.25W	Mullard MR25
			A2R104	Res. var., 500 Ω 10% 0.3W	Spectrol-Reliance 43P
			A2R105	Factory selected	
			A2R129	Res. 348k Ω 1% 1/8W	Holco H8/50
			A2R130	Res. 348k Ω 1% 1/8W	Holco H8/50
Table 7-2. Assembly A2-6742A (Avantek) : YIG tuning and bias supply					
A2	Basic YIG tuning and bias supply assembly (See Table 7)				
A2C1	Cap. 2200pF 10% 200V	Vitramon CK06BX222K			
A2C5	Cap. 10 μ F 10% 35V	ITT TAG 10/35			
A2C14	Cap. 0.01 μ F 10% 200V	Vitramon CK06BX103K			
A2C16	Cap. 2200pF 10% 200V	Vitramon CK06BX222K			

Circuit ref.	Description	Mfg. & type
Table 7-2 (contd.)		
A2R139	Not used.	
Table 7-3. Assembly A2-6754A (Avantek) : YIG tuning and bias supply		
A2	Basic YIG tuning and bias supply assembly (See Table 7)	
A2C1	Cap. 2200pF 10% 200V	Vitramon CKO6BX222K
A2C5	Cap. tant. 10 μ F 10% 35V	ITT TAG 10/35
A2C14	Cap. 0.01 μ F 10% 200V	Vitramon CKO6BX103K
A2C16	Cap. 4700pF 10% 200V	Vitramon CKO6BX472K
A2C29	Cap. 4700pF 10% 200V	Vitramon CKO6BX472K
A2CR46	Diode, zener 24V	Mullard BZY88-C24
A2CR47	Diode, zener 5.1V	ITT ZPY 5.1
A2F1	Fuse link 1A	20mm x 5mm
A2F2	Fuse link 1A	20mm x 5mm
A2Q1	Transistor	Motorola 2N4403
A2Q19	Transistor	Motorola 2N4403
A2R2	Res. 0.75 Ω 5% 3W	CGS C3A
A2R3	Res. 2.4k Ω 2% 0.25W	Mullard MR25
A2R8	Factory selected	
A2R10	Factory selected	
A2R17	Res. 8.2 Ω 3% 3W	CGS C3A
Table 7-4. Assembly A2-6760A (MT) : YIG tuning and bias supply		
A2	Basic YIG tuning and bias supply assembly (See Table 7)	
A2C1	Cap. 3300pF 10% 200V	Vitramon CKO6BX332K
A2C5	Cap. tant., 10 μ F 10% 35V	ITT TAG 10/35
A2C14	Cap. 0.01 μ F 10% 200V	Vitramon CKO6BX103K
A2C16	Cap. 4700pF 10% 200V	Vitramon CKO6BX472K
Table 7-4. Assembly A2-6760A (MT) : YIG tuning and bias supply		
A2R22	Res. 2.7 Ω 5% 3W	CGS C3A
A2R25	Res. 3.3k Ω 2% 0.25W	Mullard MR25
A2R30	Factory selected	
A2R31	Res. var., 2k Ω 10% 0.3W	Spectrol-Reliance 43P
A2R51	Res. 150k Ω 2% 0.25W	Mullard MR25
A2R52	Res. 69.8k Ω 1% 1/8W	Holco H8/50
A2R61	Res. 56k Ω 2% 0.25W	Mullard MR25
A2R85	Res. 22 Ω 2% 0.5W	Mullard MR30
A2R88	Res. 270k Ω 2% 0.25W	Mullard MR25
A2R104	Res. var., 500 Ω 10% 0.3W	Spectrol-Reliance 43P
A2R105	Factory selected	
A2R129	Res. 475k Ω 1% 1/8W	Holco H8/50
A2R130	Res. 475k Ω 1% 1/8W	Holco H8/50
A2R139	Not used.	

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
<u>Table 7-4 (contd.)</u>					
A2C29	Cap. 6800pF 10% 200V	Vitramon CKO6BX682K	A2R129	Res. 178k Ω 1% 1/8W	Holco H8/50
A2CR46	Not used		A2R130	Res. 178k Ω 1% 1/8W	Holco H8/50
A2CR47	Not used		A2R139	Not used.	
A2F1	Fuse link 1.5A				
A2F2	Fuse link 1A				
A2Q1	Transistor	Motorola 2N4401	<u>Table 7-5. Assembly A2-6766A (MI) : YIG tuning and bias supply</u>		
A2Q19	Transistor		A2	Basic YIG tuning and bias supply assembly (See Table 7)	
A2R2	Res. 0.47 Ω 5% 3W		A2C1	Cap. 3300pF 10% 200V	Vitramon CKO6BX332K
A2R3	Res. 2.4k Ω 2% 0.25W		A2C5	Cap. tant., 10 μ F 10% 35V	ITT TAG 10/35
A2R8	Factory selected		A2C14	Cap. 0.01 μ F 10% 200V	Vitramon CKO6BX103K
A2R10	Factory selected	CGS C3A	A2C16	Cap. 4700pF 10% 200V	Vitramon CKO6BX472K
A2R17	Not used		A2C29	Cap. 6800pF 10% 200V	Vitramon CKO6BX682K
A2R22	Res. 1.8 Ω 5% 3W		A2CR46	Not used	
A2R25	Res. 3.3k Ω 2% 0.25W		A2CR47	Not used	
A2R30	Factory selected		A2F1	Fuse link 1.5A	20mm x 5mm
A2R31	Res. var., 2k Ω 10% 0.3W	Spectrol-Reliance 43P	A2F2	Fuse link 1A	20mm x 5mm
A2R51	Res. 150k Ω 2% 0.25W				
A2R52	Res. 33.2k Ω 1% 1/8W		A2Q1	Transistor	Motorola 2N4401
A2R61	Res. 330k Ω 2% 0.5W		A2Q19	Transistor	Motorola 2N4401
A2R85	Res. 22 Ω 2% 0.5W		A2R2	Res. 0.47 Ω 5% 3W	CGS C3A
A2R88	Res. 270k Ω 2% 0.25W	Mullard MR25	A2R3	Res. 2.4k Ω 2% 0.25W	Mullard MR25
A2R104	Res. var., 500 Ω 10% 0.3W		A2R8	Factory selected	
A2R105	Factory selected		A2R10	Factory selected	

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
<u>Table 7-5 (contd.)</u>		
A2R17	Not used	
A2R22	Res. 1.8 Ω 5% 3W	
A2R25	Res. 3.3k Ω 2% 0.25W	
A2R30	Factory selected	CGS C3A Mullard MR25
A2R31	Res. var., 2k Ω 10% 0.3W	Spectrol-Reliance 43P
A2R51	Res. 150k Ω 2% 0.25W	Mullard MR25
A2R52	Res. 33.2k Ω 1% 1/8W	Holco H8/50
A2R61	Res. 330k Ω 2% 0.5W	Mullard MR30
A2R85	Res. 22 Ω 2% 0.5W	Mullard MR30
A2R88	Res. 180k Ω 2% 0.25W	Mullard MR25
A2R104	Res. var., 500 Ω 10% 0.3W	Spectrol-Reliance 43P
A2R105	Factory selected	
A2R129	Res. 178k Ω 1% 1/8W	Holco H8/50
A2R130	Res. 178k Ω 1% 1/8W	Holco H8/50
A2R139	Not used.	
<u>Table 7-6. Assembly A2-6766A (Varian) : YIG tuning and bias supply</u>		
A2	Basic YIG tuning and bias supply assembly (See Table 7)	
A2C1	Cap. 2200pF 10% 200V	Vitramon CKO6BX222K
A2C5	Cap. tant., 10 μ F 10% 35V	ITT TAG 10/35
<u>Circuit ref.</u>		
<u>Description</u>		
<u>Mfr. & type</u>		
A2C14	Cap. 0.01 μ F 10% 200V	Vitramon CKO6BX103K
A2C16	Cap. 4700pF 10% 200V	Vitramon CKO6BX472K
A2C29	Cap. 6800pF 10% 200V	Vitramon CKO6BX682K
A2CR46	Not used	
A2CR47	Not used	
A2F1	Fuse link 1.5A	20mm x 5mm
A2F2	Fuse link 1A	20mm x 5mm
A2Q1	Transistor	Motorola 2N4403
A2Q19	Transistor	Motorola 2N4403
A2R2	Res. 0.62 Ω 5% 3W	CGS C3A
A2R3	Res. 3k Ω 2% 0.25W	Mullard MR25
A2R8	Factory selected	
A2R10	Factory selected	
A2R17	Not used	
A2R22	Res. 2.4 Ω 5% 3W	CGS C3A
A2R25	Res. 3.9k Ω 2% 0.25W	Mullard MR25
A2R30	Factory selected	
A2R31	Res. var., 2k Ω 10% 0.3W	Spectrol-Reliance 43P
A2R51	Res. 100k Ω 2% 0.25W	Mullard MR25
A2R52	Res. 33.2k Ω 1% 1/8W	Holco H8/50
A2R61	Res. 330k Ω 2% 0.5W	Mullard MR30
A2R85	Res. 6.8 Ω 2% 0.5W	Mullard MR30
A2R88	Res. 180k Ω 2% 0.25W	Mullard MR25
A2R104	Res. var., 500 Ω 10% 0.3W	Spectrol-Reliance 43P

Circuit ref.	Description	Mfr. & type	Circuit ref.	Description	Mfr. & type
Table 7-6 (contd.)					
A2R105	Factory selected		A2R8	Factory selected	
A2R129	Res. 178k Ω 1% 1/8W	Holco H8/50	A2R10	Factory selected	
A2R130	Res. 178k Ω 1% 1/8W	Holco H8/50	A2R17	Not used	
A2R139	Not used.		A2R22	Res. 1.8 Ω 5% 3W	CGS C3A
			A2R25	Res. 3.3k Ω 2% 0.25W	Mullard MR25
			A2R30	Factory selected	
			A2R31	Res. var., 500 Ω 10% 0.3W	Spectrol-Reliance 43P
			A2R51	Res. 150k Ω 2% 0.25W	Mullard MR25
			A2R52	Res. 49.9k Ω 1% 1/8W	Holco H8/50
			A2R61	Res. 330k Ω 2% 0.5W	Mullard MR30
			A2R85	Res. 22 Ω 2% 0.5W	Mullard MR30
			A2R88	Res. 180k Ω 2% 0.25W	Mullard MR25
			A2R104	Res. var., 200 Ω 10% 0.3W	Spectrol-Reliance 43P
			A2R105	Factory selected	
			A2R129	Res. 178k Ω 1% 1/8W	Holco H8/50
			A2R130	Res. 178k Ω 1% 1/8W	Holco H8/50
			A2R139	Not used	
Table 7-7. Assembly A2-6770A (MI) : YIG tuning and bias supply					
A2	Basic YIG tuning and bias supply assembly (See Table 7)		Table 7-8. Assembly A2-6774A (MI) : YIG tuning & bias supply		
A2C1	Cap. 3300pF 10% 200V	Vitramon CKO6BX332K	A2	Basic YIG tuning and bias supply assembly (See Table 7)	
A2C5	Cap. tant., 10 μ F 10% 35V	ITT TAG 10/35	A2C1	Cap. 2200pF 10% 200V	Vitramon CKO6BX222K
A2C14	Cap. 0.01 μ F 10% 200V	Vitramon CKO6BX103K	A2C5	Cap. tant., 10 μ F 10% 35V	ITT TAG 10/35
A2C16	Cap. 4700pF 10% 200V	Vitramon CKO6BX472K			
A2C29	Cap. 6800pF 10% 200V	Vitramon CKO6BX682K			
A2CR46	Not used				
A2CR47	Not used				
A2F1	Fuse link 1.5A	20mm x 5mm			
A2F2	Fuse link 1A	20mm x 5mm			
A2Q1	Transistor	Motorola 2N4401			
A2Q19	Transistor	Motorola 2N4401			
A2R2	Res. 0.47 Ω 5% 3W	CGS C3A			
A2R3	Res. 3.3k Ω 2% 0.25W	Mullard MR25			

Circuit ref.	Description	Mfr. & type
A2R88	Res. 150k Ω 2% 0.25W	Mullard MR25
A2R104	Res. var., 200 Ω 10% 0.3W	Spectrol-Reliance 43P
A2R105	Factory selected	
A2R129	Res. 178k Ω 1% 1/8W	Holco H8/50
A2R130	Res. 178k Ω 1% 1/8W	Holco H8/50
A2R139	Not used	

Table 7-9. Assembly A2-6774A (Varian) : YIG tuning and bias supply

A2	Basic YIG tuning and bias supply assembly (See Table 7)	
A2C1	Cap. 2200pF 10% 200V	Vitramon CK06BX222K
A2C5	Cap. tant., 10 μ F 10% 35V	ITT TAG 10/35
A2C14	Cap. 0.01 μ F 10% 200V	Vitramon CK06BX103K
A2C16	Cap. 6800pF 10% 200V	Vitramon CK06BX682K
A2C29	Cap. 6800pF 10% 200V	Vitramon CK06BX682K
A2CR46	Not used	
A2CR47	Not used	
A2F1	Fuse link 1.5A	20mm x 5mm
A2F2	Fuse link 1.5A	20mm x 5mm
A2Q1	Transistor	Motorola 2N4403
A2Q19	Transistor	Motorola 2N4403
A2R2	Res. 0.56 Ω 5% 3W	CGS C3A
A2R3	Res. 3k Ω 2% 0.5W	Mullard MR30

Circuit ref.	Description	Mfr. & type
Table 7-8 (contd.)		
A2C14	Cap. 0.01 μ F 10% 200V	Vitramon CK06BX103K
A2C16	Cap. 6800pF 10% 200V	Vitramon CK06BX682K
A2C29	Cap. 6800pF 10% 200V	Vitramon CK06BX682K
A2CR46	Not used	
A2CR47	Not used	
A2F1	Fuse link 1A	20mm x 5mm
A2F2	Fuse link 1.5A	20mm x 5mm
A2Q1	Transistor	Motorola 2N4403
A2Q19	Transistor	Motorola 2N4403
A2R2	Res. 0.47 Ω 5% 3W	CGS C3A
A2R3	Res. 2.4k Ω 2% 0.5W	Mullard MR30
A2R8	Factory selected	
A2R10	Factory selected	
A2R17	Not used	
A2R22	Res. 1.8 Ω 5% 3W	CGS C3A
A2R25	Res. 3.3k Ω 2% 0.25W	Mullard MR25
A2R30	Factory selected	
A2R31	Res. var., 500 Ω 10% 0.3W	Spectrol-Reliance 43P
A2R51	Res. 150k Ω 2% 0.25W	Mullard MR25
A2R52	Res. 26.7k Ω 1% 1/8W	Holco H8/50
A2R61	Res. 330k Ω 2% 0.5W	Mullard MR30
A2R85	Res. 22 Ω 2% 0.25W	Mullard MR25

Circuit ref.	Description	Mfr. & type	Circuit ref.	Description	Mfr. & type
-----------------	-------------	-------------	-----------------	-------------	-------------

Table 7-9 (contd.)

A2R8	Factory selected		A2C1	Cap. 3300pF 10% 200V	Vitramon CK06BX332K
A2R10	Factory selected		A2C2	Cap. 0.047μF 10% 100V	Vitramon CK06BX473K
A2R17	Not used		A2C3	Cap. 150pF 10% 200V	Vitramon CK05BX151K
A2R22	Res. 1.8Ω 5% 3W	CGS C3A	A2C4	Cap. tant., 10μF 10% 35V	ITT TAG 10/35
A2R25	Res. 3.9kΩ 2% 0.25W	Mullard MR25	A2C5	Cap. 0.01μF 10% 200V	Vitramon CK06BX103K
A2R30	Factory selected				
A2R31	Res. var., 500Ω 10% 0.3W	Spectrol-Reliance 43P			
A2R51	Res. 150kΩ 2% 0.25W	Mullard MR25	A2C6	Cap. 0.01μ 10% 200V	Vitramon CK06BX103K
A2R52	Res. 26.7kΩ 1% 1/8W	Holco H8/50	A2C7	Cap. 0.01μ 10% 200V	Vitramon CK06BX103K
A2R61	Res. 220kΩ 2% 0.25W	Mullard MR25	A2C8	Cap. 560pF 10% 200V	Vitramon CK05BX561K
A2R85	Res. 6.8Ω 2% 0.25W	Mullard MR25	A2C9	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K
A2R88	Res. 150kΩ 2% 0.25W	Mullard MR25	A2C10	Cap. 0.1μF 10% 100V	Vitramon CK06BX104K
A2R104	Res. var., 200Ω 10% 0.3W	Spectrol-Reliance 43P			
A2R105	Factory selected				
A2R129	Res. 115kΩ 1% 1/8W	Holco H8/50	A2C11	Cap. 1500pF 10% 200V	Vitramon CK06BX152K
A2R130	Res. 115kΩ 1% 1/8W	Holco H8/50	A2C12	Cap. 0.01μF 10% 200V	Vitramon CK06BX103K
A2R139	Not used.		A2C13	Cap. 1500pF 10% 200V	Vitramon CK06BX152K
			A2C14	Cap. 82pF 10% 200V	Vitramon CK05BX820K
			A2C15	Cap. 470pF 10% 200V	Vitramon CK05BX471K
			A2C16	Cap. 2.2μF 20% 50V	Sprague 7C 023

Circuit
ref.

Description

Mfr. & type

Table 8 (contd.)

A2C17	Cap. 0.47 μ F 20% 50V	Vitramon VK33BW474M
A2C18	Cap. 0.22 μ F 10% 250V	Erie 51012 series
A2C19	Cap. 0.01 μ F 10% 200V	Vitramon CK06BX103K
A2C20	Cap. 0.22 μ F 10% 63V	Advance MFI MD6A
A2C21	Cap. 82pF 10% 200V	Vitramon CK05BX820K
A2CR1	Diode, rect.	Mullard IN4148
A2CR2	Diode, rect.	Mullard IN4148
A2CR3	Diode, rect.	Mullard IN4148
A2CR4	SCR	Motorola 2N4441
A2CR5	Diode, rect.	Mullard IN4004
A2CR6	Diode, zener 4.7V	Mullard BZY88-C4V7
A2CR7	Diode, rect.	Mullard IN4148
A2CR8	Diode, rect.	Mullard IN4148
A2CR9	Not used	
A2CR10	Diode, rect.	Mullard IN4148
A2CR11	Diode, rect.	Mullard IN4148
A2CR12	Diode, rect.	Mullard IN4148
A2CR13	Diode, rect.	Mullard IN4148
A2CR14	Diode, rect.	Mullard IN4148
A2CR15	Diode, rect.	Mullard IN4148
A2CR16	Diode, rect.	Mullard IN4148
A2CR17	Diode, rect.	Mullard IN4148
A2CR18	Diode, rect.	Mullard IN4148

Circuit
ref.

Description

Mfr. & type

A2CR19	Diode, rect.	Mullard IN4148
A2CR20	Diode, rect.	Mullard IN4148
A2CR21	Diode, rect.	Mullard IN4004
A2CR22	Diode, rect.	Mullard IN4004
A2CR23	Diode, constant current 2mA	Motorola IN5305
A2CR24	Diode, rect.	Mullard IN4148
A2CR25	Diode, rect.	Mullard IN4148
A2CR26	Diode, rect.	Mullard IN4148
A2CR27	Diode, rect.	Mullard IN4148
A2CR28	Diode, rect.	Mullard IN4148
A2CR29	Diode, rect.	Mullard IN4148
A2CR30	Diode, rect.	Mullard IN4148
A2CR31	Diode, zener 8.2V	Mullard BZY88-C8V2
A2CR32	Diode, rect.	Mullard IN4148
A2CR33	Diode, rect.	Mullard IN4148
A2CR34	Factory selected	
A2CR35	Diode, constant current 1mA	Motorola IN5297
A2CR36	Diode, constant current 1mA	Motorola IN5297
A2CR37	Not used	
A2CR38	Diode, zener 24V	Mullard BZY88-C24
A2CR39	Diode, zener 75V	Mullard BZX70-C75
A2CR40	Diode, rect.	Mullard IN4148
A2CR41	Diode, rect.	Mullard IN4148
A2CR42	Diode, rect.	Mullard IN4148

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfg. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfg. & type</i>
Table 8 (contd.)					
A2CR43	Diode, rect.	Mullard IN4148	A2Q9	Transistor	Motorola MM4001
A2CR44	Diode, rect.		A2Q10	Not used	
A2CR45	Diode, rect.	Mullard IN4148	A2Q11	FET	Motorola 2N4092
A2CR46	Diode, rect.		A2Q12	Transistor	Motorola 2N4403
A2CR47	Diode, rect.	Mullard IN4148	A2Q13	Transistor	Motorola MM4001
A2CR48	Diode, rect.		A2Q14	Transistor	Motorola 2N4401
A2CR49	Diode, rect.	Mullard IN4148	A2Q15	Transistor	Motorola 2N4403
A2F1	Fuse link 1A	20mm x 5mm	A2Q16	Transistor	Motorola MPSU55
A2F2	Fuse link 50mA		A2Q17	Not used	
A21C1	Operational amp.	National LM301AH	A2Q18	Transistor	Motorola 2N4401
A21C2	Operational amp.	National LM301AH	A2Q19	Transistor	Motorola 2N4403
A21C3	Dual op. amp.	Motorola MC1458P	A2R1	Not used	
A21C4	Dual op. amp.	Motorola MC1458P	A2R2	Res. 2.7k Ω 2% 0.5W	Mullard MR30
A2K1	Relay, reed	MI 6700/277	A2R3	Res. 20.0k Ω 1% 1/8W	Holco H8/50
A2Q1	Transistor	Motorola 2N4401	A2R4	Res. 6.2k Ω 2% 0.25W	Mullard MR25
A2Q2	Transistor	Motorola 2N4401	A2R5	Res. 2.2k Ω 2% 0.25W	Mullard MR25
A2Q3	Transistor, dual	Motorola 2N2919	A2R6	Res. 220 Ω 2% 0.25W	Mullard MR25
A2Q4	Transistor	Motorola MM4001	A2R7	Res. 470 Ω 2% 0.5W	Mullard MR30
A2Q5	Transistor	Motorola MM3001	A2R8	Res. 33 Ω 2% 0.25W	Mullard MR25
A2Q6	Transistor	Motorola MM3001	A2R9	Res. 1.8 Ω 5% 3W	CGS C3A
A2Q7	Transistor	Motorola 2N4403	A2R10	Res. 180 Ω 2% 0.25W	Mullard MR25
A2Q8	Transistor	Motorola MM4001	A2R11	Res. 15k Ω 2% 0.25W	Mullard MR25
			A2R12	Res. 470 Ω 2% 0.25W	Mullard MR25
			A2R13	Res. 22k Ω 2% 0.25W	Mullard MR25
			A2R14	Res. 1.96k Ω 1% 1/8W	Holco H8/50

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
Table 8 (contd.)		
A2R15	Res. var., 2k Ω 10% 0.3W	Spectrol-Reliance 43P Holco H8/50 Mullard MR25
A2R16	Res. 1.96k Ω 1% 1/8W	
A2R17	Res. 220 Ω 2% 0.25W	
A2R18	Not used	
A2R19	Not used	
A2R20	Not used	Mullard MR25 Holco H8/50
A2R21	Res. 1.8k Ω 2% 0.25W	
A2R22	Res. 12k Ω 2% 0.25W	
A2R23	Res. 12.1k Ω 1% 1/8W	
A2R24	Not used	
A2R25	Not used	CGS C3A CGS C3A
A2R26	Not used	
A2R27	Factory selected	
A2R28	Factory selected	
A2R29	Factory selected	
A2R30	Factory selected	Spectrol-Reliance 43P
A2R31	Factory selected	
A2R32	Factory selected	
A2R33	Factory selected	
A2R34	Factory selected	
A2R35	Factory selected	Spectrol-Reliance 43P
A2R36	Factory selected	
A2R37	Factory selected	

*Circuit
ref.*

Description

Mfr. & type

A2R38	Res. 33.2k Ω 1% 1/8W	Holco H8/50
A2R39	Not used	
A2R40	Not used	
A2R41	Not used	
A2R42	Res. 1k Ω 2% 0.25W	
A2R43	Res. 470 Ω 2% 0.25W	Mullard MR25
A2R44	Res. 3.9k Ω 2% 0.25W	Mullard MR25
A2R45	Res. 26.1k Ω 1% 1/8W	Holco H8/50
A2R46	Not used	
A2R47	Not used	
A2R48	Res. 270 Ω 5% 3W	
A2R49	Res. 300 Ω 1% 3W	
A2R50	Res. var., 50 Ω 10% 0.3W	Spectrol-Reliance 43P
A2R51	Not used	
A2R52	Res. var., 20 Ω 10% 0.3W	
A2R53	Not used	
A2R54	Res. var., 20 Ω 10% 0.3W	
A2R55	Not used	Spectrol-Reliance 43P
A2R56	Res. var., 20 Ω 10% 0.3W	
A2R57	Res. var., 20 Ω 10% 0.3W	
A2R58	Res. var., 20 Ω 10% 0.3W	
A2R59	Res. var., 10 Ω 10% 0.3W	
A2R60	Res. var., 10 Ω 10% 0.3W	Spectrol-Reliance 43P
A2R61	Res. var., 10 Ω 10% 0.3W	

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
Table 8 (contd.)					
A2R62	Res. var., 10 Ω 10% 0.3W	Spectrol-Reliance 43P Spectrol-Reliance 43P CGS C3A	A2R85	Res. 56.2k Ω 1% 1/8W	Holco H8/50
A2R63	Res. var., 50 Ω 10% 0.3W		A2R86	Res. 3.3k Ω 2% 0.25W	Mullard MR25
A2R64	Res. 100 Ω 5% 3W		A2R87	Res. 100 Ω 2% 0.25W	Mullard MR25
A2R65	Res. 560k Ω 2% 0.5W	Mullard MR30 Holco H8/50 Holco H8/50 Holco H8/50 Mullard MR25	A2R88	Res. 47k Ω 2% 0.25W	Mullard MR25
A2R66	Res. 49.9k Ω 1% 1/8W		A2R89	Res. 69.8k Ω 1% 1/8W	Holco H8/50
A2R67	Res. 464k Ω 1% 1/8W		A2R90	Res. 10M 10% 1/8W	Mullard CR25
A2R68	Res. 464k Ω 1% 1/8W		A2R91	Res. 20k Ω 2% 0.25W	Mullard MR25
A2R69	Res. 1.2k Ω 2% 0.25W		A2R92	Res. 120k Ω 2% 0.25W	Mullard MR25
A2R70	Res. 22 Ω 2% 0.25W	Mullard MR25	A2R93	Res. 47k Ω 2% 0.25W	Mullard MR25
*A2R71	Factory selected		A2R94	Res. 68 Ω 2% 0.25W	Mullard MR25
*A2R72	Res. var., 50k Ω 10% 0.3W		A2R95	Res. 10k Ω 2% 0.25W	Mullard MR25
A2R73	Not used	Spectrol-Reliance 43P	A2R96	Res. 39k Ω 2% 0.5W	Mullard MR30
A2R74	Res. 68k Ω 2% 0.25W		A2R97	Res. 20k Ω 2% 1,25W	Mullard MR25
			A2R98	Not used	
A2R75	Res. 2k Ω 2% 0.25W	Mullard MR25	A2R99	Res. 47k Ω 2% 0.5W	Mullard MR30
A2R76	Res. 15k Ω 2% 0.25W		A2R100	Res. 3.9k Ω 2% 0.25W	Mullard MR25
A2R77	Res. 150 Ω 2% 0.25W		A2R101	Res. 220 Ω 2% 0.25W	Mullard MR25
A2R78	Res. var., 20k Ω 10% 0.3W	Spectrol-Reliance 43P Holco H8/50	A2R102	Res. 475k Ω 1% 1/8W	Holco H8/50
A2R79	Res. 40.2k Ω 1% 1/8W		A2R103	Res. 20k Ω 2% 0.25W	Mullard MR25
			A2R104	Res. 6.8k Ω 2% 0.25W	Mullard MR25
A2R80	Res. 6.81k Ω 1% 1/8W	Holco H8/50 ERG EEX-0.125-750K-F-C2	A2R105	Res. 2.2M 10% 1/8W	Mullard CR25
A2R81	Res. 750k Ω 1% 1/8W		A2R106	Res. 22k Ω 2% 0.25W	Mullard MR25
A2R82	Not used		A2R107	Res. 4.7k Ω 2% 0.25W	Mullard MR25
A2R83	Not used	Spectrol-Reliance 43P	A2R108	Res. 475k Ω 1% 1/8W	Holco H8/50
A2R84	Res. var., 20k Ω 10% 0.3W		A2R109	Res. 10k Ω 2% 0.25W	Mullard MR25

Circuit ref.	Description	Mfr. & type
A9R1	Res. 10k Ω 2% 0.25W	Mullard MR25
A9R2	Res. 2.7k Ω 2% 0.25W	Mullard MR25
A9R3	Res. 10k Ω 2% 0.25W	Mullard MR25
	Solder terminals	Cambion 180-2753-2
Table 11. Assembly A3 : Auxiliary reference board (6701/109)		
(Not used in type 6790A)		
A3C1	Cap. 0.1 μ F 10% 100V	Vitramon CKO6BX104K
A3C2	Cap. 10pF 10% 200V	Vitramon CKO5BX100K
A3C3	Cap. 0.01 μ F 10% 200V	Vitramon CKO6BX103K
A3CR1	Diode, rect.	Mullard IN4148
A3CR2	Diode, rect.	Mullard IN4148
A3CR3	Diode, rect. Vacant terminal positions sometimes used as convenient location of zener diode CR1 across bias supply (See Table 2-2)	
A3Q1	Transistor	Motorola 2N4403
A3Q2	Transistor	Motorola 2N4403
A3Q3	Transistor	Motorola 2N4401
A3Q4	Transistor	Motorola 2N4401
A3Q5	Transistor	Motorola 2N4401
A3Q6	Not used	
A3Q7	Transistor	Motorola 2N4403

Circuit ref.	Description	Mfr. & type
A9R1	Res. 10k Ω 2% 0.25W	Mullard MR25
A9R2	Res. 2.7k Ω 2% 0.25W	Mullard MR25
A9R3	Res. 10k Ω 2% 0.25W	Mullard MR25
	Solder terminals	Cambion 180-2753-2
Table 11. Assembly A3 : Auxiliary reference board (6701/109) (Not used in type 6790A)		
A3C1	Cap. 0.1 μ F 10% 100V	Vitramon CK06BX104K
A3C2	Cap. 10pF 10% 200V	Vitramon CK05BX100K
A3C3	Cap. 0.01 μ F 10% 200V	Vitramon CK06BX103K
A3CR1	Diode, rect.	Mullard IN4148
A3CR2	Diode, rect.	Mullard IN4148
A3CR3	Diode, rect. Vacant terminal positions sometimes used as convenient location of zener diode CRI across bias supply (See Table 2-2)	
A3Q1	Transistor	Motorola 2N4403
A3Q2	Transistor	Motorola 2N4403
A3Q3	Transistor	Motorola 2N4401
A3Q4	Transistor	Motorola 2N4401
A3Q5	Transistor	Motorola 2N4401
A3Q6	Not used	
A3Q7	Transistor	Motorola 2N4403

Circuit ref.	Description	Mfr. & type
-----------------	-------------	-------------

Table 11 (contd.)

A3R1	Res. 820Ω 2% 0.25W	
A3R2	Res. 10kΩ 2% 0.25W	Mullard MR25
		Mullard MR25
A3R3	Res. 1kΩ 2% 0.25W	Mullard MR25
A3R4	Res. 390Ω 2% 0.25W	Mullard MR25
A3R5	Res. 3.6kΩ 2% 0.25W	Mullard MR25
A3R6	Res. 10kΩ 2% 0.25W	Mullard MR25
A3R7	Res. 4.7kΩ 2% 0.25W	Mullard MR25
A3R8	Res. 5.1kΩ 2% 0.25W	Mullard MR25
A3R9	Res. 12kΩ 2% 0.25W	Mullard MR25
A3R10	Res. 2.7kΩ 2% 0.25W	Mullard MR25
A3R11	Res. 1kΩ 2% 0.25W	Mullard MR25
A3R12	Res. 560Ω 2% 0.25W	Mullard MR25
A3R13	Not used	
A3R14	Res. 1kΩ 2% 0.25W	Mullard MR25
	Terminal lugs	Cambion 1032-2

Table 12. Assembly A4 : Symmetrical sweep width switch

(For types 6742A, 6754A, 6760A)

A4C1	Cap. 2200pF 10% 100V	Vitramon CKO5BX222K
A4R1	Res. var., 10kΩ log	Part of A4S1
A4R2	Res. 6.98kΩ 1% 1/8W	Holco H8/50

Circuit ref.	Description	Mfr. & type
-----------------	-------------	-------------

A4R3	Res. 3.48kΩ 1% 1/8W	Holco H8/50
A4R4	Res. 1.74kΩ 1% 1/8W	Holco H8/50
A4R5	Res. 698Ω 1% 1/8W	Holco H8/50
A4R6	Res. 348Ω 1% 1/8W	Holco H8/50
A4R7	Res. 174Ω 1% 1/8W	Holco H8/50
A4R8	Res. 69.8Ω 1% 1/8W	Holco H8/50
A4R9	Res. 34.8Ω 1% 1/8W	Holco H8/50
A4R10	Res. 17.4Ω 1% 1/8W	Holco H8/50
A4R11	Res. 47kΩ 2% 0.25W	Mullard MR25
A4S1	Switch/pot assy.	MI 6700/035

Table 13. Assembly A4 : Symmetrical sweep width switch

(For types 6730A, 6790A)

A4C1	Cap. 2200pF 10% 100V	Vitramon CKO5BX222K
A4R1	Res. var., 10kΩ Log	Part of A4S1
A4R2	Res. 6.98kΩ 1% 1/8W	Holco H8/50
A4R3	Res. 3.48kΩ 1% 1/8W	Holco H8/50
A4R4	Res. 1.40kΩ 1% 1/8W	Holco H8/50
A4R5	Res. 698Ω 1% 1/8W	Holco H8/50
A4R6	Res. 348Ω 1% 1/8W	Holco H8/50
A4R7	Res. 140Ω 1% 1/8W	Holco H8/50
A4R8	Res. 69.8Ω 1% 1/8W	Holco H8/50
A4R9	Res. 34.8Ω 1% 1/8W	Holco H8/50

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
-------------------------	--------------------	------------------------

Table 13 (contd.)

A4R10	Res. 14.0Ω 1% 1/8W	Holco H8/50
A4R11	Res. 47kΩ 2% 0.25W	Mullard MR25
A4S1	Switch/pot. assy.	MI 6700/035

Table 14. Assembly A4 : Symmetrical sweep width switch

(For types 6738A, 6770A)

A4C1	Cap. 2200pF 10% 100V	Vitramon CK05BX222K
A4R1	Res. var., 10kΩ Log	Part of A4S1
A4R2	Res. 6.98kΩ 1% 1/8W	Holco H8/50
A4R3	Res. 2.80kΩ 1% 1/8W	Holco H8/50
A4R4	Res. 1.40kΩ 1% 1/8W	Holco H8/50
A4R5	Res. 698Ω 1% 1/8W	Holco H8/50
A4R6	Res. 280Ω 1% 1/8W	Holco H8/50
A4R7	Res. 140Ω 1% 1/8W	Holco H8/50
A4R8	Res. 69.8Ω 1% 1/8W	Holco H8/50
A4R9	Res. 28.0Ω 1% 1/8W	Holco H8/50
A4R10	Res. 14.0Ω 1% 1/8W	Holco H8/50
A4R11	Res. 47kΩ 2% 0.25W	Mullard MR25
A4S1	Switch/pot. assy.	MI 6700/035

A4R10	Res. 14.0Ω 1% 1/8W	Holco H8/50
A4R11	Res. 47kΩ 2% 0.25W	Mullard MR25
A4S1	Switch/pot. assy.	MI 6700/035

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
-------------------------	--------------------	------------------------

Table 15. Assembly A4 : Symmetrical sweep width switch

(For type 6766A)

A4C1	Cap. 2200pF 10% 100V	Vitramon CK05BX222K
A4R1	Res. var., 10kΩ Log	Part of A4S1
A4R2	Res. 6.34kΩ 1% 1/8W	Holco H8/50
A4R3	Res. 3.16kΩ 1% 1/8W	Holco H8/50
A4R4	Res. 1.58kΩ 1% 1/8W	Holco H8/50
A4R5	Res. 634Ω 1% 1/8W	Holco H8/50
A4R6	Res. 316Ω 1% 1/8W	Holco H8/50
A4R7	Res. 158Ω 1% 1/8W	Holco H8/50
A4R8	Res. 63.4Ω 1% 1/8W	Holco H8/50
A4R9	Res. 31.6Ω 1% 1/8W	Holco H8/50
A4R10	Res. 15.8Ω 1% 1/8W	Holco H8/50
A4R11	Res. 47kΩ 2% 0.25W	Mullard MR25
A4S1	Switch/pot. assy.	MI 6700/035

Table 16. Assembly A4 : Symmetrical sweep width switch

(For type 6774A)

A4C1	Cap. 2200pF 10% 100V	Vitramon CK05BX222K
A4R1	Res. var., 10kΩ Log	Part of A4S1
A4R2	Res. 6.19kΩ 1% 1/8W	Holco H8/50
A4R3	Res. 2.49kΩ 1% 1/8W	Holco H8/50
A4R4	Res. 1.24kΩ 1% 1/8W	Holco H8/50

Circuit ref.	Description	Mfr. & type
-----------------	-------------	-------------

Table 16 (contd.)

A4R5	Res. 619Ω 1% 1/8W	Holco H8/50
A4R6	Res. 249Ω 1% 1/8W	Holco H8/50
A4R7	Res. 124Ω 1% 1/8W	Holco H8/50
A4R8	Res. 61.9Ω 1% 1/8W	Holco H8/50
A4R9	Res. 24.9Ω 1% 1/8W	Holco H8/50
A4R10	Res. 12.4Ω 1% 1/8W	Holco H8/50
A4R11	Res. 47kΩ 2% 0.25W	Mullard MR25
A4S1	Switch/pot. assy.	MI 6700/035

Table 17. Assembly A11, heat exchanger (6701/112)

(Used in types 6760A, 6766A, 6770A, 6774A)

A11CR1	Diode, zener 6.2V	Mullard BZY88-C6V2
A11Q1	Transistor	Motorola 2N4403
A11Q2	Transistor	Motorola MJE 1102
A11R1	Res. 6.8kΩ 2% 0.25W	Mullard MR25
A11R2	Res. 6.8kΩ 2% 0.25W	Mullard MR25
A11R3	Res. 1kΩ 2% 0.25W	Mullard MR25
A11R4	Res. 1kΩ 2% 0.25W	Mullard MR25
A11R5	Res. 20Ω 5% 3W (6760A, 6766A, 6770A)	CGS C3A
A11R5	Res. 10Ω 5% 3W (6774A)	CGS C3A

Table 18. Assembly A5 : Control logic board

(For type 6790A)

A5C1	Cap. 0.01Ω 10% 200V	Vitramon CK06BX103K
A5C2	Cap. 0.001Ω 10% 200V	Vitramon CK05BX102K
A5C3	Cap. 0.001Ω 10% 200V	Vitramon CK05BX102K
A5C4	Cap. 0.047Ω 10% 100V	Vitramon CK06BX473K
A5C5	Cap. 470pF 10% 200V	Vitramon CK05BX471K
A5C6	Cap. 0.1Ω 10% 50V	Vitramon CK06BX104K
A5C7	Cap. 0.001Ω 10% 200V	Vitramon CK05BX102K
A5C8	Cap. 0.01Ω 10% 200V	Vitramon CK06BX103K
A5C9	Cap. 470pF 10% 200V	Vitramon CK05BX471K
A5C10	Cap. 470pF 10% 200V	Vitramon CK05BX471K
A5C11	Cap. 0.1Ω 10% 50V	Vitramon CK06BX104K
A5C12	Cap. 0.1Ω 10% 50V	Vitramon CK06BX104K
A5C13	Cap. 100pF 10% 200V	Vitramon CK05BX101K
A5C14	Cap. 0.1Ω 10% 50V	Vitramon CK06BX104K
A5C15	Cap. 0.01Ω 10% 200V	Vitramon CK06BX103K
A5C16	Cap. 10pF 10% 200V	Vitramon CK05BX100K
A5CR1	Diode	Mullard IN4148
A5CR2	Diode	Mullard IN4148
A5CR3	Diode	Mullard IN4148
A5CR4	Diode	Mullard IN4148
A5CR5	Diode	Mullard IN4148

Circuit ref.	Description	Mfg. & type	Circuit ref.	Description	Mfg. & type
Table 18 (contd.)					
A5CR6	Diode	Mullard IN4148	A5Q6	Transistor	Motorola 2N4401
A5CR7	Diode		A5Q7	Transistor	Motorola 2N4403
A5CR8	Diode		A5Q8	Transistor	Motorola 2N4401
A5CR9	Diode		A5Q9	Transistor	Motorola 2N4401
A5CR10	Diode		A5Q10	Transistor	Motorola 2N4401
A5CR11	Diode	Mullard IN4148	A5Q11	Transistor	Motorola 2N4403
A5CR12	Diode		A5Q12	Transistor	Motorola 2N4401
A5CR13	Diode		A5Q13	Transistor	Motorola 2N4401
A5IC1	Triple NAND gate		A5Q14	Transistor	Motorola 2N4403
A5IC2	Operational amp.		A5Q15	Transistor	Motorola 2N4401
A5IC3	Dual op. amp.	Motorola MC1458P	A5Q16	Transistor	Motorola 2N4403
A5IC4	Dual op. amp.		A5Q17	Transistor	Motorola 2N4401
A5IC5	Multiplexer		A5Q18	Transistor	Motorola MPSU55
A5IC6	Operational amp.		A5Q19	Transistor	Motorola 2N4401
A5K1	Reed relay		A5Q20	Transistor	Motorola 2N4401
A5K2	Reed relay	Fairchild μ A 741C	A5Q21	Transistor	Motorola 2N4401
A5Q1	Transistor		A5Q22	Transistor	Motorola 2N4401
A5Q2	Transistor		A5Q23	Transistor	Motorola 2N4401
A5Q3	Transistor		A5Q24	Transistor	Motorola 2N4401
A5Q4	Transistor		A5Q25	Transistor	Motorola 2N4401
A5Q5	Transistor	Motorola 2N4403	A5Q26	Transistor	Motorola 2N4403
			A5Q27	Transistor	Motorola 2N4403
			A5Q28	Transistor	Motorola 2N4401
			A5Q29	Transistor	Motorola 2N4403

<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>	<i>Circuit ref.</i>	<i>Description</i>	<i>Mfr. & type</i>
Table 18 (contd.)					
A5Q30	Transistor	Motorola 2N4403	A5R18	Res. 10k Ω 1% 1/8W	Holco H8/50
A5Q31	Transistor	Motorola 2N4401	A5R19	Res. 10k Ω 1% 1/8W	Holco H8/50
A5Q32	Transistor	Motorola 2N4401	A5R20	Res. 33k Ω 2% 0.25W	Mullard MR25
A5Q33	Transistor	Motorola 2N4403	A5R21	Res. 10k Ω 1% 1/8W	Holco H8/50
A5Q34	Transistor	Motorola 2N4401	A5R22	Res. 4.7k Ω 2% 0.25W	Mullard MR25
A5Q35	Transistor	Motorola 2N4403	A5R23	Res. 68 Ω 2% 0.25W	Mullard MR25
A5R1	Res. 4.7k Ω 2% 0.25W	Motorola 2N4403	A5R24	Res. var., 2k Ω 10% 0.3W	Spectrol Reliance 43P
A5R2	Res. 6.8k Ω 2% 0.25W	Mullard MR25	A5R25	Res. 28.7k Ω 1% 1/8W	Holco H8/50
A5R3	Res. 470 Ω 2% 0.25W	Mullard MR25	A5R26	Res. 10k Ω 0.05% 0.1W	Erg. EE-0.10-10K-AC4
A5R4	Res. 4.7k Ω 2% 0.25W	Mullard MR25	A5R27	Res. 4.7k Ω 2% 0.25W	Mullard MR25
A5R5	Res. 4.7k Ω 2% 0.25W	Mullard MR25	A5R28	Res. 1k Ω 2% 0.25W	Mullard MR25
A5R6	Res. 15k Ω 2% 0.25W	Mullard MR25	A5R29	Res. 5.6k Ω 2% 0.25W	Mullard MR25
A5R7	Res. 10k Ω 2% 0.25W	Mullard MR25	A5R30	Res. 20k Ω 0.05% 0.1W	Erg. EE-0.10-20K-AC4
A5R8	Res. 6.8k Ω 2% 0.25W	Mullard MR25	A5R31	Res. var., 2k Ω 10% 0.3W	Spectrol Reliance 43P
A5R9	Res. 6.8k Ω 2% 0.25W	Mullard MR25	A5R32	Res. 30.1k Ω 1% 1/8W	Holco H8/50
A5R10	Res. 10k Ω 2% 0.25W	Mullard MR25	A5R33	Res. 10k Ω 0.05% 0.1W	Erg. EE-0.10-10K-AC4
A5R11	Res. 10k Ω 2% 0.25W	Mullard MR25	A5R34	Res. 4.7k Ω 2% 0.25W	Mullard MR25
A5R12	Res. 4.7k Ω 2% 0.25W	Mullard MR25	A5R35	Res. 1k Ω 2% 0.25W	Mullard MR25
A5R13	Res. 150 Ω 2% 0.25W	Mullard MR25	A5R36	Res. 20k Ω 0.05% 0.1W	Erg. EE-0.10-20K-AC4
A5R14	Res. 150 Ω 2% 0.25W	Mullard MR25	A5R37	Res. 5.6k Ω 2% 0.25W	Mullard MR25
A5R15	Res. 4.7k Ω 2% 0.25W	Mullard MR25	A5R38	Res. 10k Ω 0.05% 0.1W	Erg. EE-0.10-10K-AC4
A5R16	Res. 10k Ω 1% 1/8W	Holco H8/50	A5R39	Res. 10k Ω 0.05% 0.1W	Erg. EE-0.10-10K-AC4
A5R17	Res. var., 2k Ω 10% 0.3W	Spectral Reliance 43P	A5R40	Res. 4.7k Ω 2% 0.25W	Mullard MR25
			A5R41	Res. var., 2k Ω 10% 0.3W	Spectrol Reliance 43P

Circuit ref.	Description	Mfr. & type	Circuit ref.	Description	Mfr. & type
Table 18 (contd.)					
A5R42	Res. 14k Ω 1% 1/8W	Holco H8/50	A5R65	Res. 10k Ω 2% 0.25W	Mullard MR25
A5R43	Res. 10k Ω 0.05% 0.1W		A5R66	Res. 10k Ω 2% 0.25W	Mullard MR25
A5R44	Res. 10k Ω 0.05% 0.1W		A5R67	Not used	
A5R45	Res. 3.3k Ω 2% 0.25W	Erg. EE-0.10-20K-AC4 Erg. EE-0.10-20K-AC4	A5R68	Res. 10k Ω 2% 0.25W	Mullard MR25
A5R46	Res. 10k Ω 2% 0.25W		A5R69	Res. 20k Ω 1% 1/8W	Holco H8/50
A5R47	Res. 10k Ω 2% 0.25W		A5R70	Res. 10k Ω 2% 0.25W	Mullard MR25
A5R48	Res. 10k Ω 2% 0.25W	Mullard MR25	A5R71	Res. 15k Ω 2% 0.25W	Mullard MR25
A5R49	Res. 470 Ω 2% 0.25W		A5R72	Res. 20k Ω 1% 1/8W	Holco H8/50
A5R50	Res. 4.7k Ω 2% 0.25W		A5R73	Res. 330k Ω 5% 0.25W	Mullard CR25
A5R51	Res. 470 Ω 2% 0.5W	Mullard MR25	A5R74	Res. 22k Ω 2% 0.25W	Mullard MR25
A5R52	Res. 470 Ω 2% 0.5W		A5R75	Res. 220k Ω 2% 0.25W	Mullard MR25
A5R53	Res. 10k Ω 2% 0.25W		A5R76	Res. 10k Ω 2% 0.25W	Mullard MR25
A5R54	Res. 3.3k Ω 2% 0.25W	Mullard MR30	A5R77	Res. 10k Ω 2% 0.25W	Mullard MR25
A5R55	Res. 10k Ω 2% 0.25W		A5R78	Res. 10k Ω 2% 0.25W	Mullard MR25
A5R56	Res. 10k Ω 2% 0.25W		A5R79	Res. 10k Ω 2% 0.25W	Mullard MR25
A5R57	Res. 10k Ω 2% 0.25W	Mullard MR25	A5R80	Res. 560 Ω 2% 0.25W	Mullard MR25
A5R58	Res. 20k Ω 1% 1/8W		A5R81	Res. 15k Ω 2% 0.25W	Mullard MR25
A5R59	Res. 10k Ω 2% 0.25W		A5R82	Res. 3.3k Ω 2% 0.25W	Mullard MR25
A5R60	Res. 15k Ω 2% 0.25W	Holco H8/50	A5R83	Res. 4.7k Ω 2% 0.25W	Mullard MR25
A5R61	Res. 20k Ω 1% 1/8W		A5R84	Res. 1k Ω 2% 0.25W	Mullard MR25
A5R62	Res. 270k Ω 2% 0.25W		A5R85	Res. 4.7k Ω 2% 0.25W	Mullard MR25
A5R63	Res. 22k Ω 2% 0.25W	Mullard MR25	A5R86	Res. 820 Ω 2% 0.25W	Mullard MR25
A5R64	Res. 220k Ω 2% 0.25W		A5R87	Res. 10k Ω 2% 0.25W	Mullard MR25
			A5R88	Res. 1k Ω 2% 0.25W	Mullard MR25
			A5R89	Res. 5.1k Ω 2% 0.25W	Mullard MR25

Circuit ref.	Description	Mfr. & type	Circuit ref.	Description	Mfr. & type
Table 18 (contd.)					
A5R90	Res. 12k Ω 2% 0.25W	Mullard MR25			
A5R91	Res. 390 Ω 2% 0.25W	Mullard MR25			
A5R92	Res. 2.7k Ω 2% 0.25W	Mullard MR25			
A5R93	Res. 1k Ω 2% 0.25W	Mullard MR25			
A5R94	Res. 3.6k Ω 2% 0.25W	Mullard MR25			
A5R95	Res. 10k Ω 2% 0.25W	Mullard MR25			
A5R96	Res. 560 Ω 2% 0.25W	Mullard MR25			
A5R97	Res. 1k Ω 2% 0.25W	Mullard MR25			
A5R98	Factory selected				
A5R99	Factory selected				

Chapter 7

SERVICING DIAGRAMS

CONTENTS

Para.

- 1 Introduction

Table

- 1 Circuit symbols

Page

2

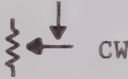
Fig.

- | | | | | | | | | |
|----|---|-----|-----|-----|-----|-----|-----|-----------|
| 1 | Typical YIG or varactor tuned r.f. unit : Assembly and component identification (units other than type 6790A) | ... | ... | ... | ... | ... | ... | Page
3 |
| 2 | Type 6790A : Assembly and component identification | ... | ... | ... | ... | ... | ... | 5 |
| 3 | Varactor-tuned r.f. unit (type 6730A) : Overall schematic diagram | ... | ... | ... | ... | ... | ... | 7 |
| 4 | Varactor-tuned r.f. unit (type 6790A) : Overall schematic diagram | ... | ... | ... | ... | ... | ... | 9 |
| 5 | YIG tuned r.f. unit : Overall schematic diagram | ... | ... | ... | ... | ... | ... | 11 |
| 6 | Leveller assembly A1 : Component identification | ... | ... | ... | ... | ... | ... | 12 |
| 7 | Leveller assembly A1 : Circuit diagram (2 sheets) | ... | ... | ... | ... | ... | ... | 13-15 |
| 8 | Varactor tuning and bias supply assembly A2 : Component identification | ... | ... | ... | ... | ... | ... | 17 |
| 9 | Varactor tuning and bias supply assembly A2 : Circuit diagram (2 sheets) | ... | ... | ... | ... | ... | ... | 19-21 |
| 10 | YIG tuning and bias supply assembly A2 : Component identification | ... | ... | ... | ... | ... | ... | 23 |
| 11 | YIG tuning and bias supply assembly A2 : Circuit diagram (3 sheets) | ... | ... | ... | ... | ... | ... | 25-29 |
| 12 | Auxiliary/reference supply assembly A3 : Component identification | ... | ... | ... | ... | ... | ... | 31 |
| 13 | Auxiliary/reference supply assembly A3 : Circuit diagram | ... | ... | ... | ... | ... | ... | 31 |
| 14 | Control logic assembly (type 6790A only) A5 : Component identification | ... | ... | ... | ... | ... | ... | 32 |
| 15 | Control logic assembly (type 6790A only) A5 : Circuit diagram | ... | ... | ... | ... | ... | ... | 33 |
| 16 | Symmetrical sweep assembly A4 : Wiring diagram and component identification | ... | ... | ... | ... | ... | ... | 34 |
| 17 | Heat exchanger assembly A11 : Component identification | ... | ... | ... | ... | ... | ... | 35 |
| 18 | Heat exchanger assembly A11 : Circuit diagram | ... | ... | ... | ... | ... | ... | 35 |

INTRODUCTION

1. This chapter contains assembly drawings, circuit diagrams and component location drawings for the r.f. unit assembly and subassemblies. Table 1 provides circuit symbols which are unique to the diagrams and drawings of this chapter.

TABLE 1 CIRCUIT SYMBOLS

1.	Resistance in ohms, capacitance in microfarads unless otherwise indicated.	
2.		Screwdriver adjustment
		Front panel control
3.		Front panel designation
		Rear panel designation
4.		Printed circuit card border
		Main signal path
5.	P/O = part of	
6.		Wiper moves in direction of CW arrow when control rotated clockwise
7.		Test point
8.		Zener diode;  SCR
9.		Constant current diode
10.		Indicates socket connection and pin number
11.		Indicates solder connection and pin number
12.		Denotes chassis ground
13.		Denotes signal ground

Supplement 1

BIAS TRACKING AND BIAS SWITCHING

CONTENTS

Para.

- 1 Bias tracking
- 2 Circuit description
- 7 Adjustment of bias tracking
- 8 Bias switching
- 9 Circuit description
- 11 Testing bias switching

Fig.

	Page
1 Bias tracking circuit diagram	2
2 Assembly A8 component location	2
3 Bias switching circuit diagram	4
4 Bias switching component location	4

BIAS TRACKING

1. In order to optimize the performance of the high-power Avantek oscillators fitted in RF Units 6738A, 6742A and 6754A, it is necessary to apply a bias voltage which increases linearly with increasing frequency. The best voltage for operation at the lowest frequency is specified for each individual oscillator and is in the range 7-13 V. At the front of the copy of this manual supplied with the particular unit, the recommended setting will be found. At the highest frequency, all such oscillators require 15 V. The oscillator terminal for this supply is marked Vc since it is connected to the collector of the output transistor.

Circuit description

2. Fig. 1 shows the circuit arrangement for bias tracking. Principally it is simply a matter of applying an adjustable sample of the tuning voltage to the reference input, pin 2, of bias supply operational amplifier ICI. The control loop must cause the output bias voltage to rise in sympathy with the tuning voltage in order to maintain equal potentials at pins 2 and 3 of ICI.

3. In Fig. 1, [A] is connected to A2R29 (see Chap.7, Fig. 11/2). Over the calibrated frequency range of any r.f. unit, this voltage varies between +0.328 and +9.672, but with F1 and F2 controls set at their mechanical limits in F1-F2 sweep mode, the range is 0 to +10 V. Further, in SYM M1 mode, if M1 is set to a high frequency and the sweep width setting is large, the tuning voltage can rise to +12.

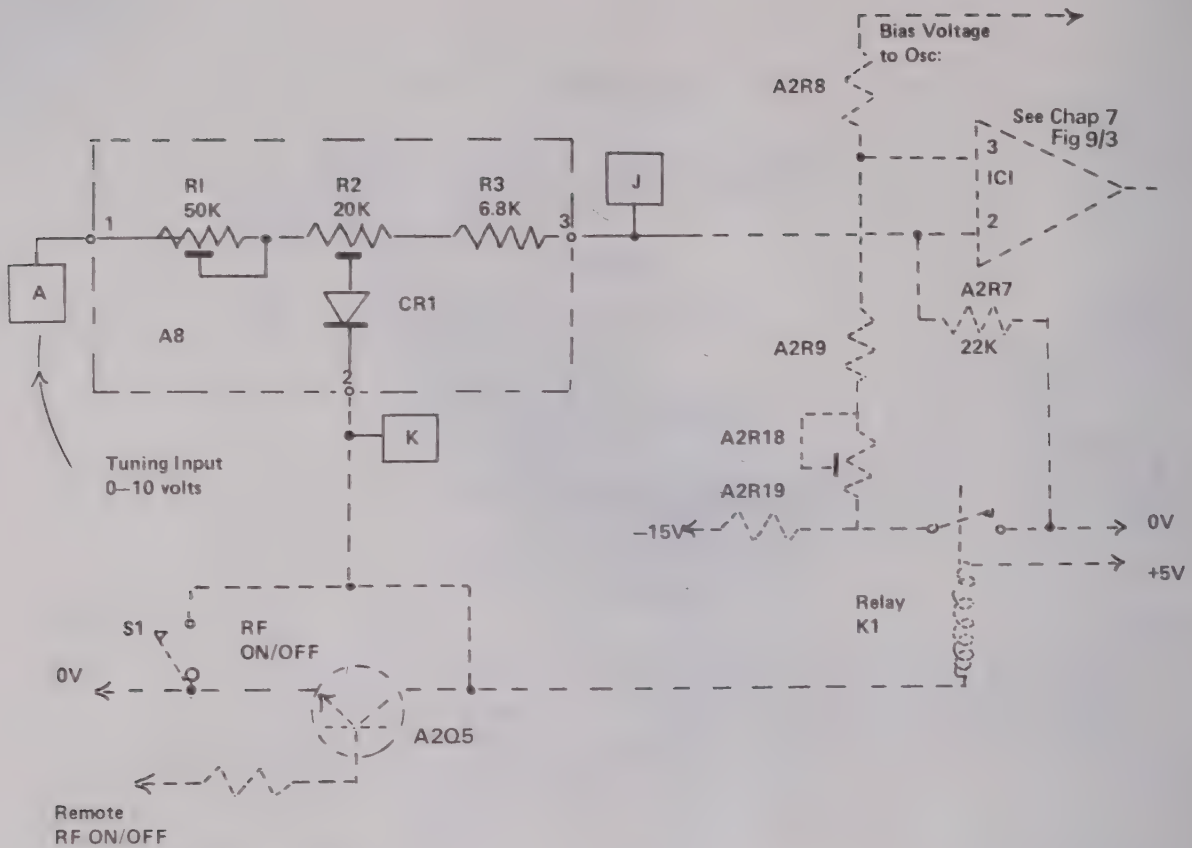
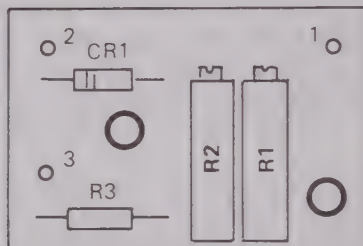


Fig. 1 Bias tracking circuit diagram



Assembly A8 is mounted on threaded spacers on the main Tuning & Bias Supply, Ass'y A2

Fig. 2 Bias tracking component location

4. Such excursions of tuning voltage must be prevented from driving the bias voltage above +15; yet +15 must be achieved when the tuning voltage reaches +9.672. The cathode of A8CR1 is connected to the collector of A2Q5 which is at +5V unless an RF OFF command is applied, when it falls to 0V. A8R2 is adjusted so that, when **A** rises above 9.672V, **J** does not follow that increase.

5. In a typical case of an oscillator requiring +10 V bias at its lowest frequency and +15 at the high end, **J** rises from almost 0v to about +3V and pin 3 of ICI follows this rise. To allow this to happen, diode A2CR5 (Chap.7, Fig. 11/3) is removed when bias tracking is employed.

6. When complete r.f. suppression is commanded, either by operation of the front panel switch or by a remote signal via A2Q5, the collector of Q5 falls to 0V and relay A2K1 is energised. J is now restricted to the range 0 to approximately +1V and, since K1 has shorted A2R18 to 0V, the output bias voltage stays in the range 0-2V, sufficiently low to stop oscillation of the source.

Adjustment of bias tracking

7. (1) Set sweeper controls as follows and connect r.f. unit to mainframe with an extension lead:-

F1, M1	Low calibrated limit
F2, M2	High calibrated limit
SWEEP FUNCTION	CW M1
SWEEP TIME (SEC)	Manual
VARIABLE	Fully clockwise
SWEEP TRIGGER	Auto
MARKER AMPLITUDE	Fully anti-clockwise
RF ON/OFF	On (up)
LEVELLER	OFF
RF LEVEL	Fully clockwise

- (2) Turn A8R2 fully anti-clockwise.
- (3) Connect a voltmeter between A3-M(+) and A3-N(-) and turn on a.c. power.
- (4) Ascertain the low-frequency bias voltage for the oscillator from the front of the instruction manual for the particular r.f. unit, related to it by serial number. Adjust A2R18 if necessary to achieve the desired reading within ± 0.2 V.
- (5) Slowly turn the M1 control clockwise and observe that the voltmeter reading steadily increases up to a maximum of 14.8 to 15.0 V when the M1 pointer reaches the high calibrated limit for the band. Adjust A8R1 if necessary to achieve 14.9 ± 0.1 V. If adjustment of A8R1 is necessary, return M1 to the low limit and repeat (4) and (5).
- (6) With M1 set to the high calibrated limit, adjust A8R2 until the bias voltage reduces to 14.8.
- (7) Set SYM. SWEEP WIDTH switch fully clockwise and the concentric variable control fully anti-clockwise.
- (8) Leaving M1 at the high calibrated limit, turn SWEEP FUNCTION to SYM. M1.
- (9) Slowly increase sweep width, by turning the variable control clockwise, while observing the voltmeter. The reading must not exceed +15.0 V even at full sweep width. Adjust A8R2 if necessary to arrive at a maximum voltage of 14.9 - 15.0.
- (10) Move the RF ON/OFF switch to OFF and observe that the voltage falls to less than +2.

BIAS SWITCHING

8. Avantek oscillators fitted in RF Units 6738A and 6742A have two bias voltage terminals, one of which requires the tracked voltage described in para.1; the other requires a fixed +15 V supply. In order to ensure complete suppression of oscillation when an RF OFF command is applied, a transistor switching circuit is employed - see Fig. 3.

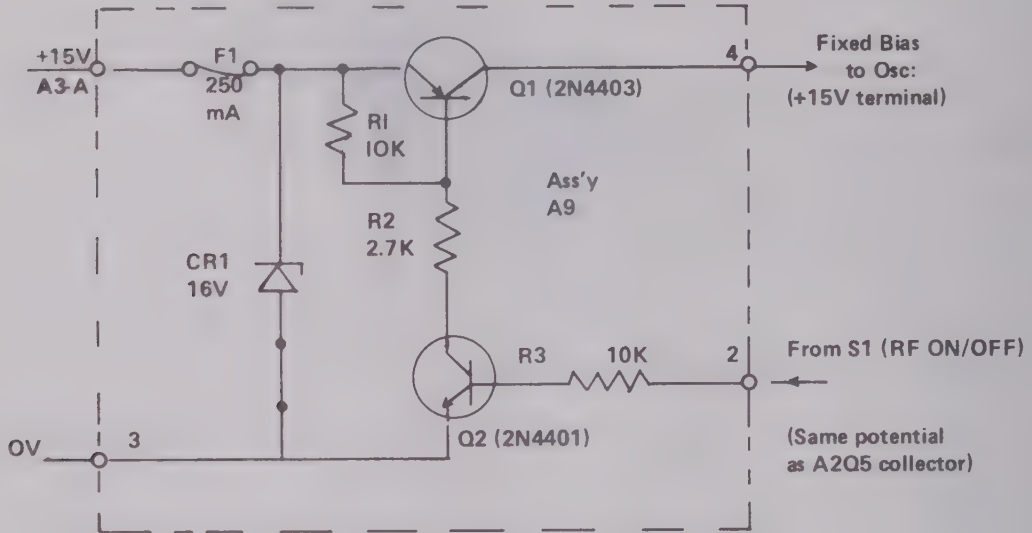


Fig. 3 Bias switching, circuit diagram

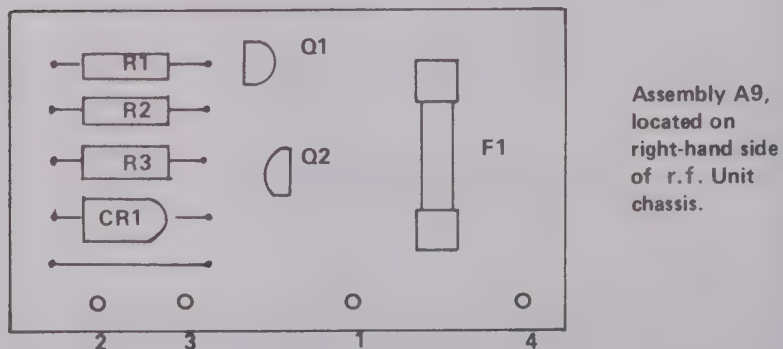


Fig. 4 Bias switching, component location

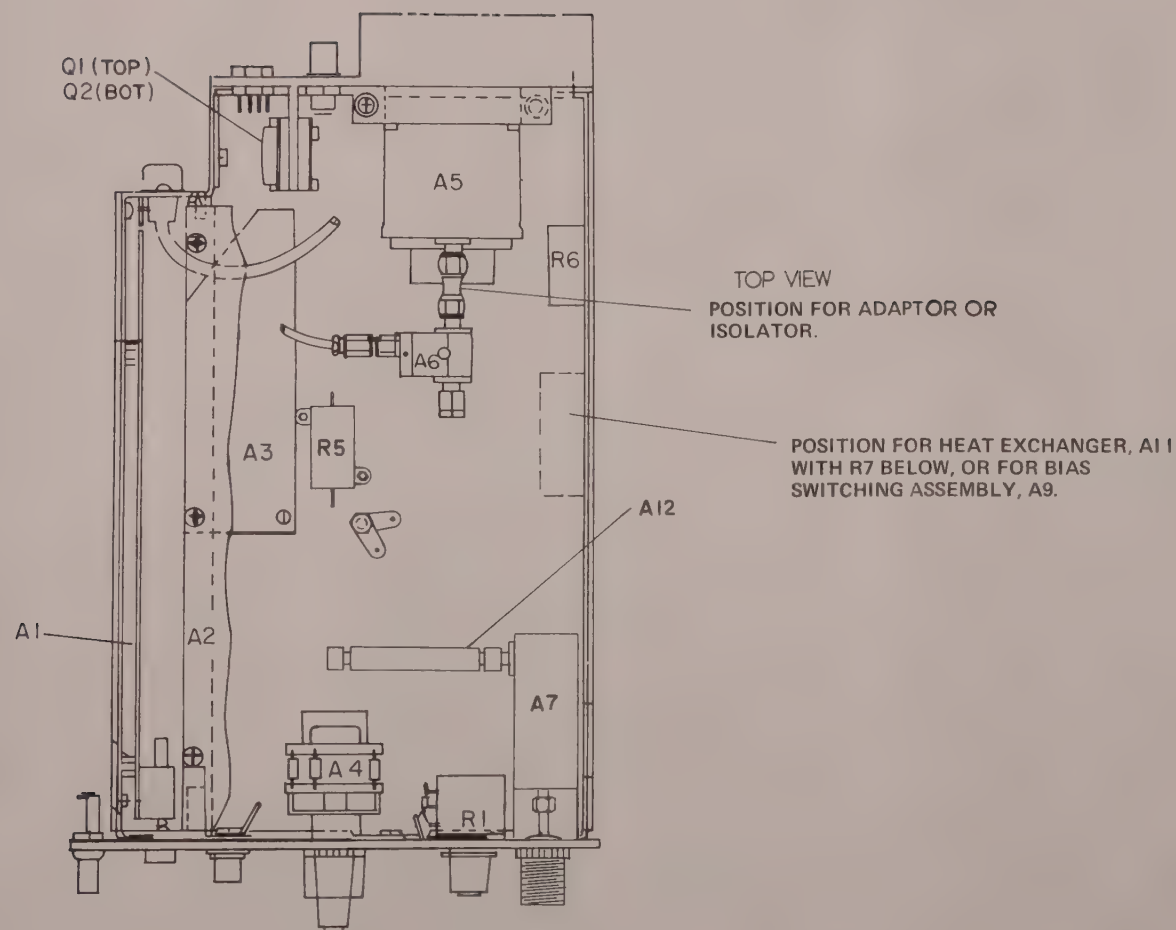
Circuit description

9. In normal operation (RF ON), the point on switch S1 to which A9R3 is connected is at +5 volts. Thus both Q2 and Q1 are conducting and almost +15 V is fed to the oscillator. When the RF ON/OFF switch is moved to OFF, or when a remote RF OFF signal causes the collector of A2Q5 to fall to 0V, Q2 is cut off and Q1 shuts off the supply to the oscillator.

10. Fuse A9F1 and zener diode A9CR1 are included to protect the oscillator in the event of a fault which might cause the +15V supply to rise.

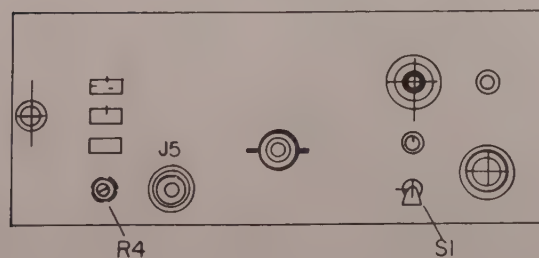
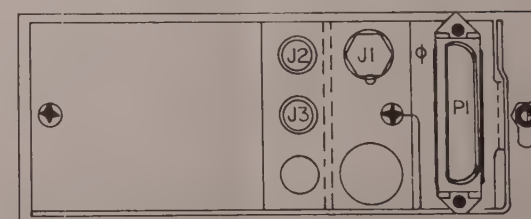
Testing bias switching

11. Measuring between pin 4 of assembly A9 and chassis, a voltage of +14.8 $\pm$ 0.2 V should be present in the RF ON condition and should fall to zero with the RF ON/OFF switch set to OFF.



FRONT PANEL ASSY

REAR PANEL ASSY



Typical YIG or varactor tuned r.f. unit : Assembly and component identification (units other than type 6790A).

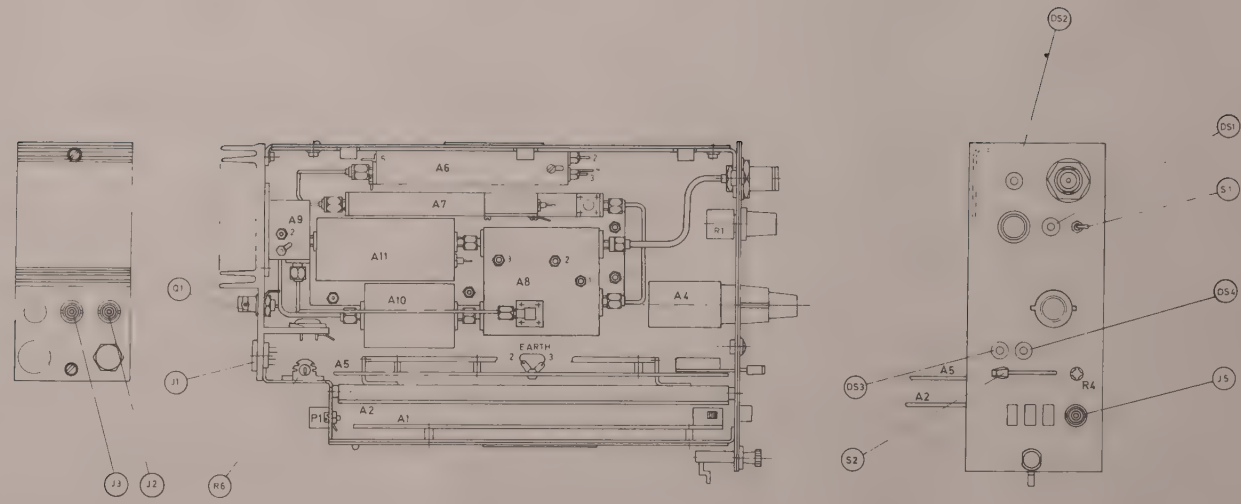
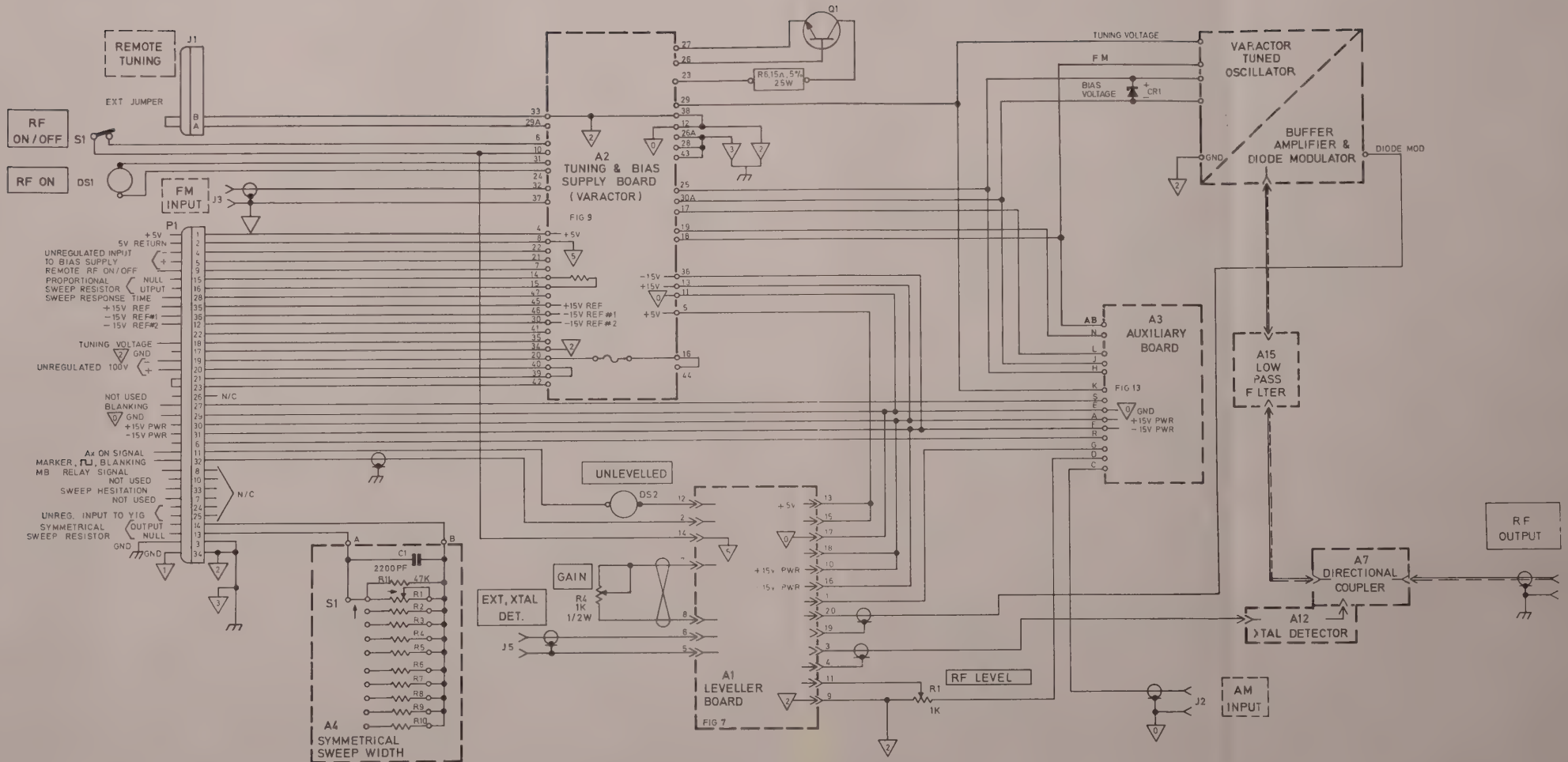


Fig. 2

June 78

Type 6790A : Assembly and component identification.



Varactor-tuned r.f. unit (type 6730A) : Overall schematic diagram.

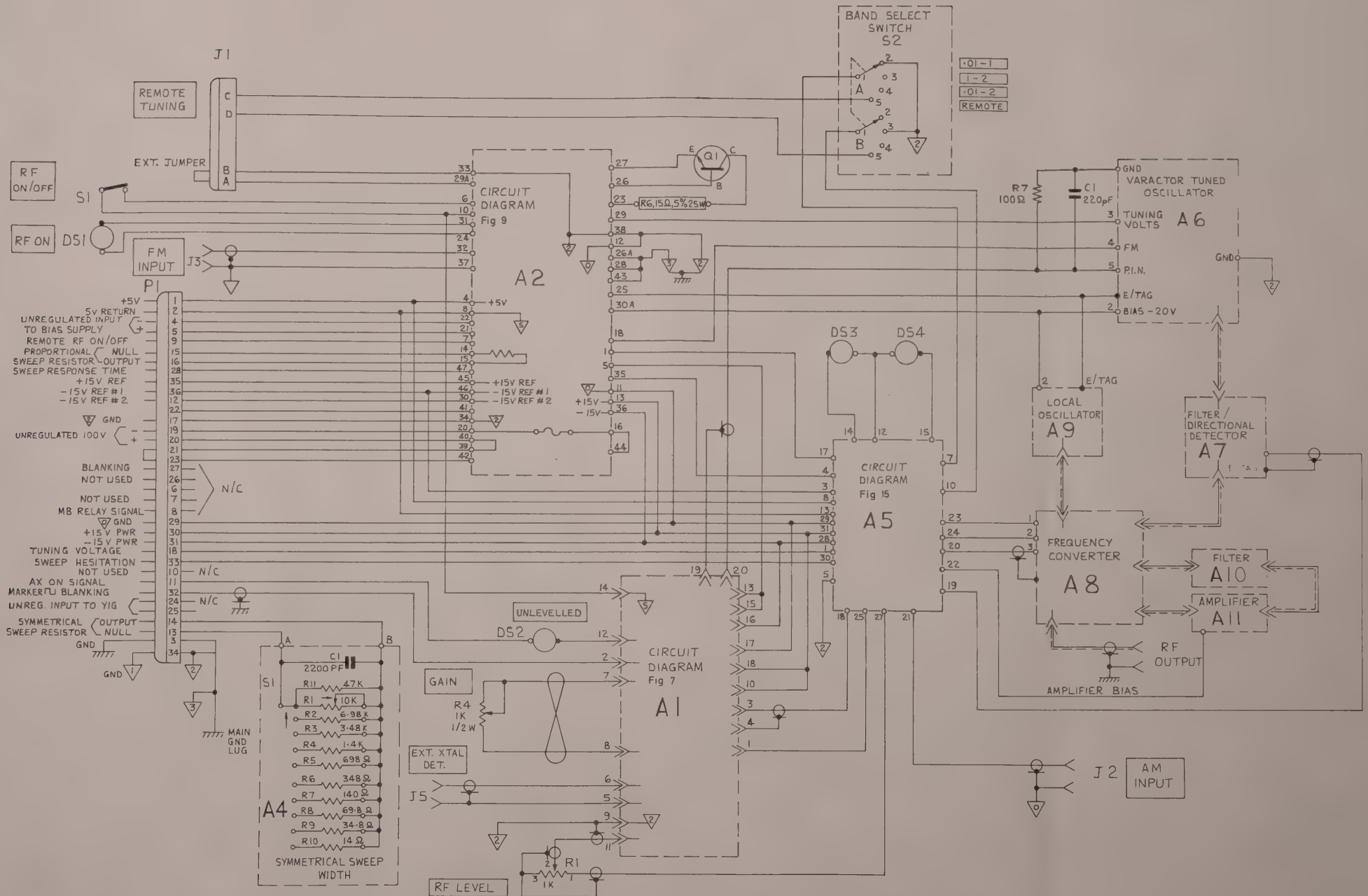


CHART 1

RF UNIT TYPE	Q1	Q2	R5	R7	CR1	CR2
6738A (Avantek)	MJ 900	MJ 1000	34.8 Ω 1% 25W	-	BZX70-C16	-
6742A (Avantek)	MJ 900	MJ 1000	34.8 Ω 1% 25W	-	BZX70-C16	-
6754A (Avantek)	MJ 900	MJ 1000	15 Ω 1% 25W	-	BZX70-C16	ZPY 5.1
6760A (MI)	MJ 1000	MJ 1000	10 Ω 1% 50W	8 Ω 5% 25W	Note 4	-
6766A (MI)	MJ 1000	MJ 1000	10 Ω 1% 50W	8 Ω 5% 25W	Note 4	-
6766A (Varian)	MJ 900	MJ 1000	10 Ω 1% 50W	8 Ω 5% 25W	Note 4	-
6770A (MI)	Note 7	MJ 1000	10 Ω 1% 50W	8 Ω 5% 25W	Note 4	-
6774A (Varian)	MJ 900	MJ 1000	6.8 Ω 1% 50W	6 Ω 5% 25W	Note 4	-
6774A (MI)	MJ 1000	MJ 1000	6.8 Ω 1% 50W	6 Ω 5% 25W	Note 4	-

CHART 2

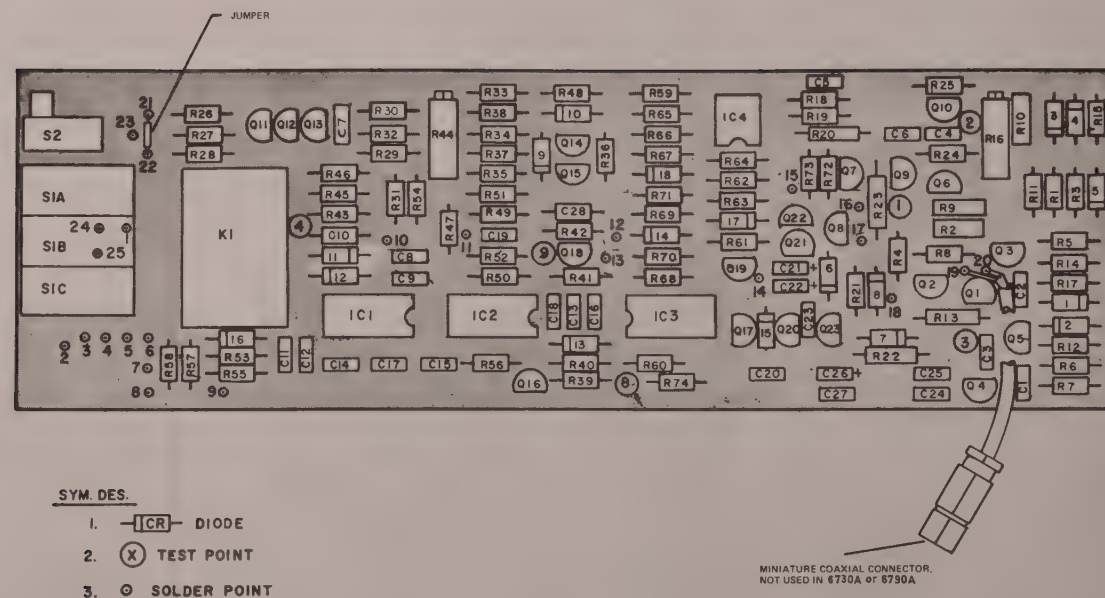
RF UNIT TYPE	A3 AUXILIARY BOARD TERMINALS								
	H	J	K	L	M	N	P	A	F
6738A (Avantek)	FM+	FM-	Tuning	Heater	Vc	Gnd Lug	N/C	Note 6	N/C
6742A (Avantek)	FM+	FM-	Tuning	Heater	Vc	Gnd Lug	N/C	Note 6	N/C
6754A (Avantek)	FM+	FM-	Tuning	Heater	Vc	Gnd Lug	-5V	N/C	N/C
6760A (MI)	FM+	FM-	Note 5	N/C	GUNN+	GUNN-	N/C	Heater	Heater
6766A (MI)	FM+	FM-	Note 5	N/C	GUNN+	GUNN-	N/C	Heater	Heater
6766A (Varian)	FM+	FM-	Note 5	N/C	VB+	VB-	N/C	N/C	N/C
6770A (MI)	FM+	FM-	Note 5	N/C	GUNN+	GUNN-	N/C	Heater	Heater
6774A (Varian)	FM+	FM-	Note 5	N/C	VB+	VB-	N/C	N/C	N/C
6774A (MI)	FM+	FM-	Note 5	N/C	GUNN+	GUNN-	N/C	Heater	Heater

Notes...

1. When R7 is not used, tuning coil neg. is wired direct to A3-K.
2. All ground connections are made at ground lugs.
3. Used only on types 6760A, 6766A, 6770A and 6774A.
4. Value selected at test.
5. A3-K goes via R7 to tuning coil -.
6. A3-A goes via A9 Ass'y to oscillator +15 V.
7. Q1 is MJ 900 if r.f. oscillator requires positive bias voltage, and MJ 1000 if oscillator requires negative bias voltage.



Fig. 5
Chap. 7
Page 11



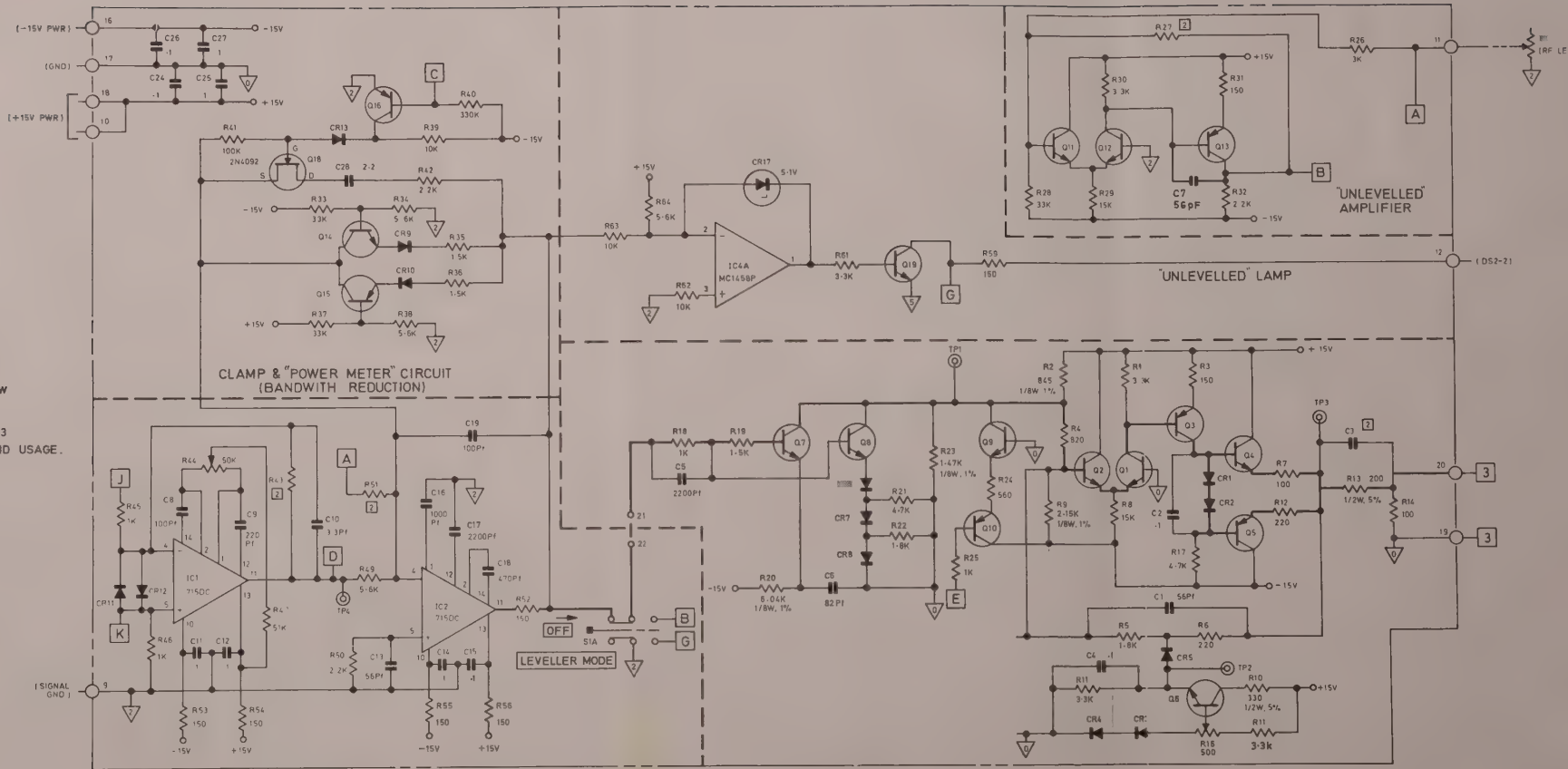
NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL
RESISTOR VALUES ARE IN OHMS, 2%, 0.25W
CAPACITOR VALUES ARE IN μ F
DIODES ARE IN4148

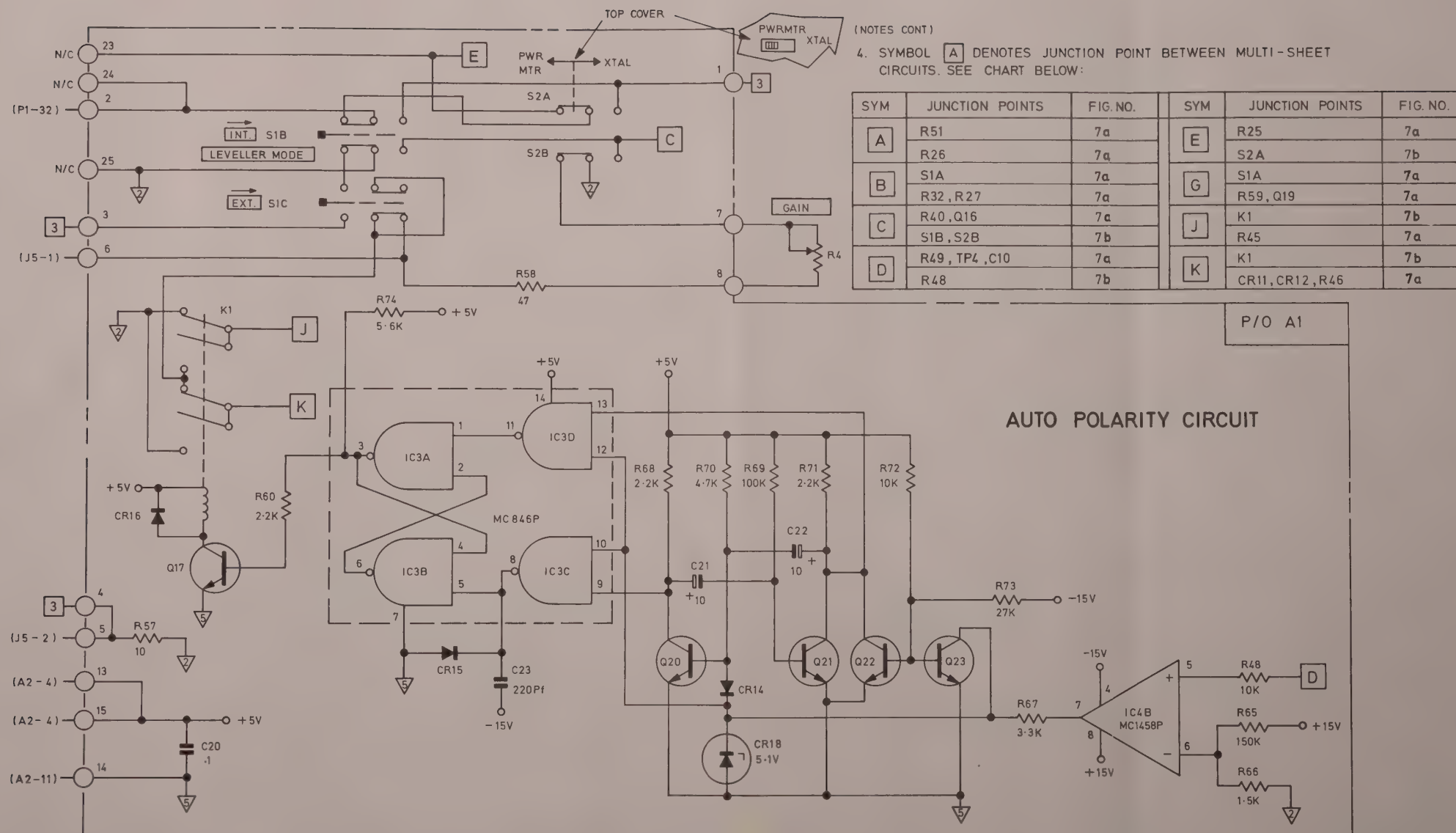
TRANSISTORS ARE NPN 2N4401, PNP 2N4403

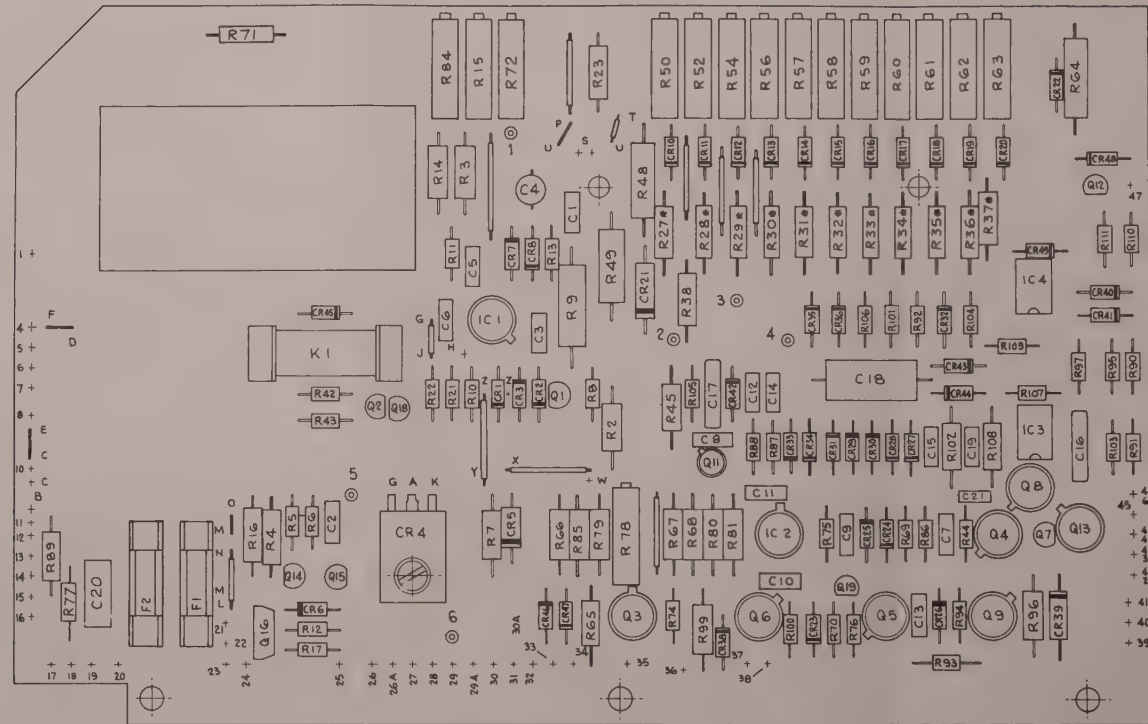
2. SEE SPECIFIC PARTS LIST FOR VALUES AND USAGE.

3. SEE SPECIFIC OVERALL SCHEMATIC
(NOTES CONT ON FIG 7b)

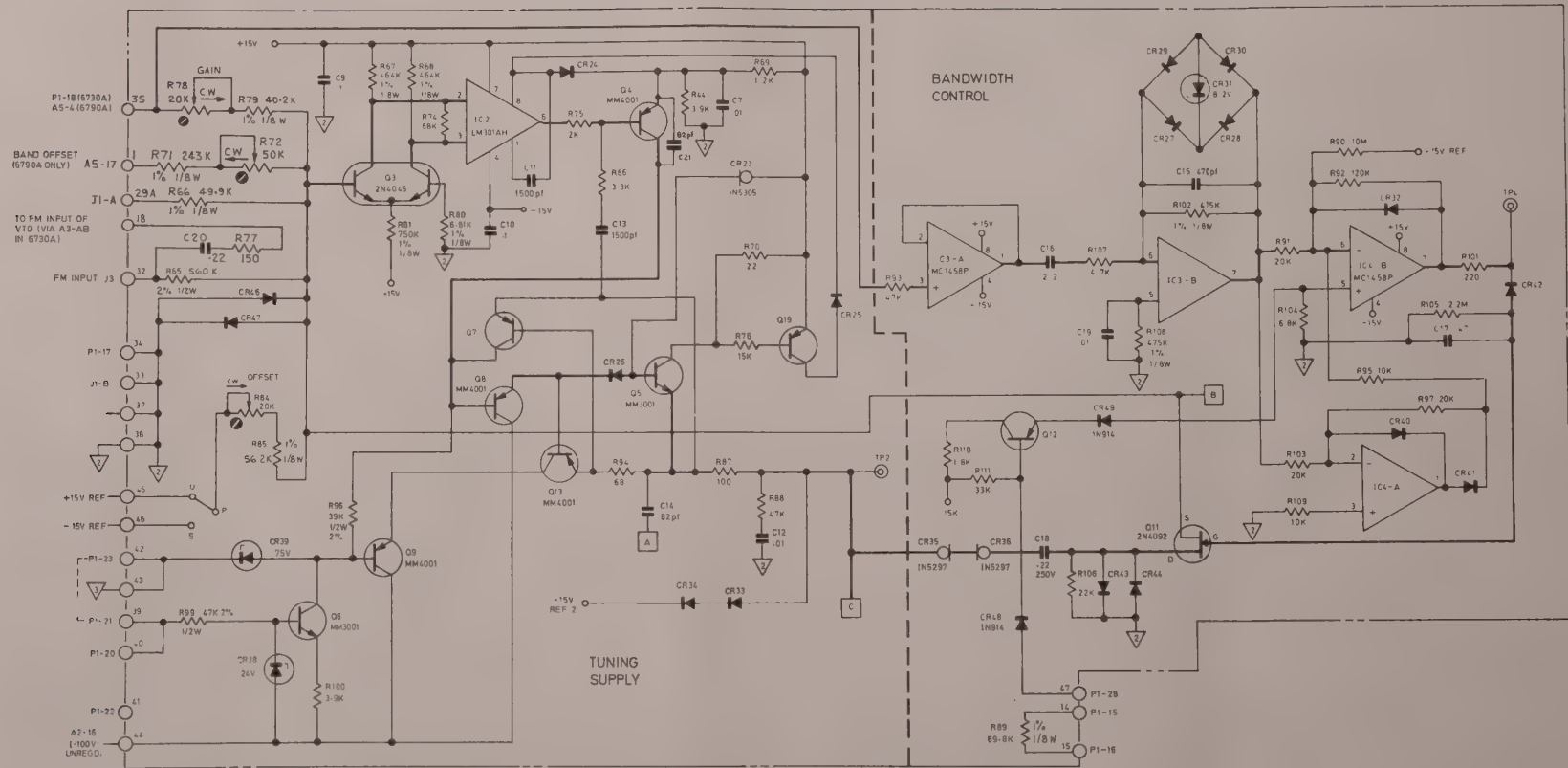


Leveller assembly A1 : Circuit diagram (Sheet 1)





Varactor tuning and bias supply assembly A2 : Component identification.



Varactor tuning and bias supply assembly A2 : Circuit diagram
(Sheet 1)

Notes...

1. JUMPER PLACEMENT CHART

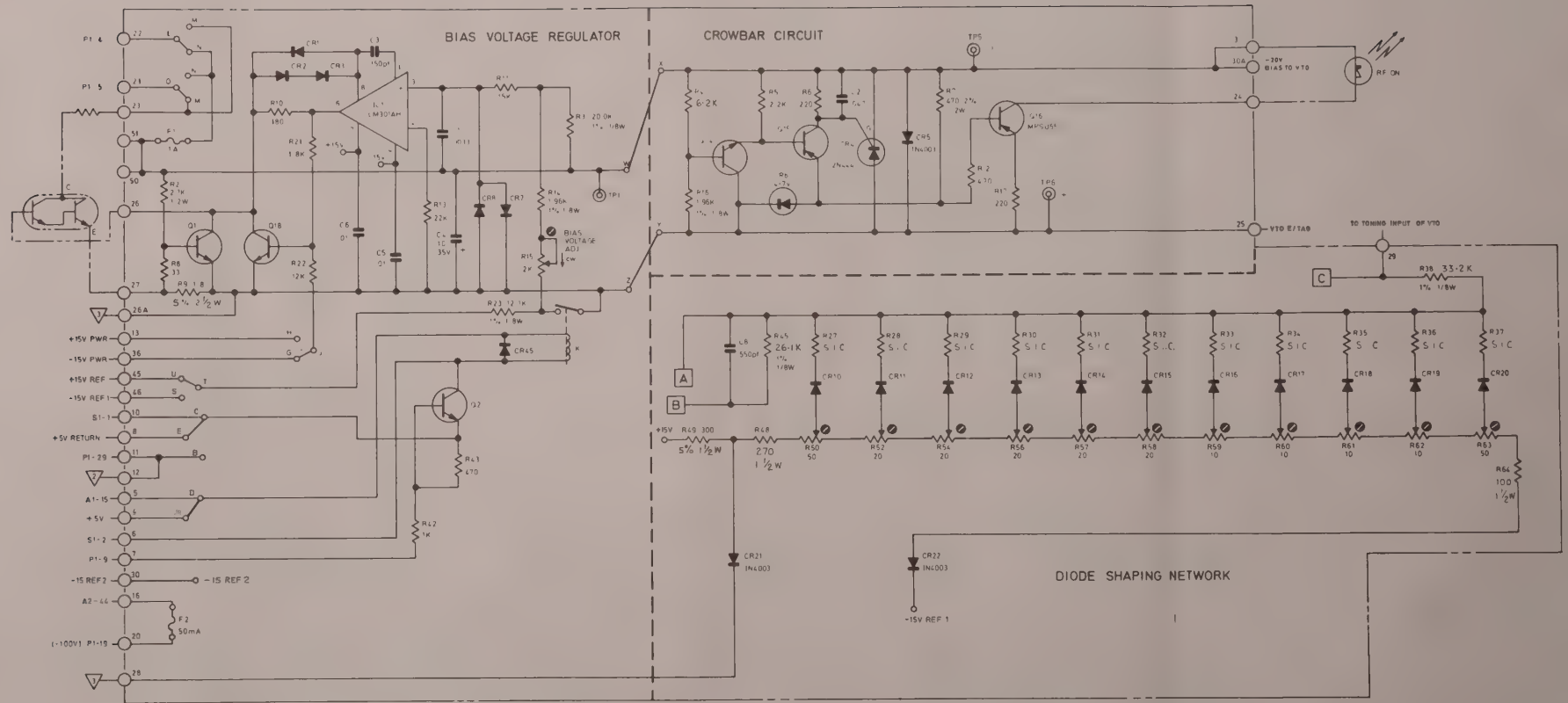
Jumper placement on varactor tuning and bias supply p.c. board	Y-Z
	W-X
	P-U
	U-T
	J-G
	D-F
	C-E
	N-L
	M-O

2. Unless otherwise stated

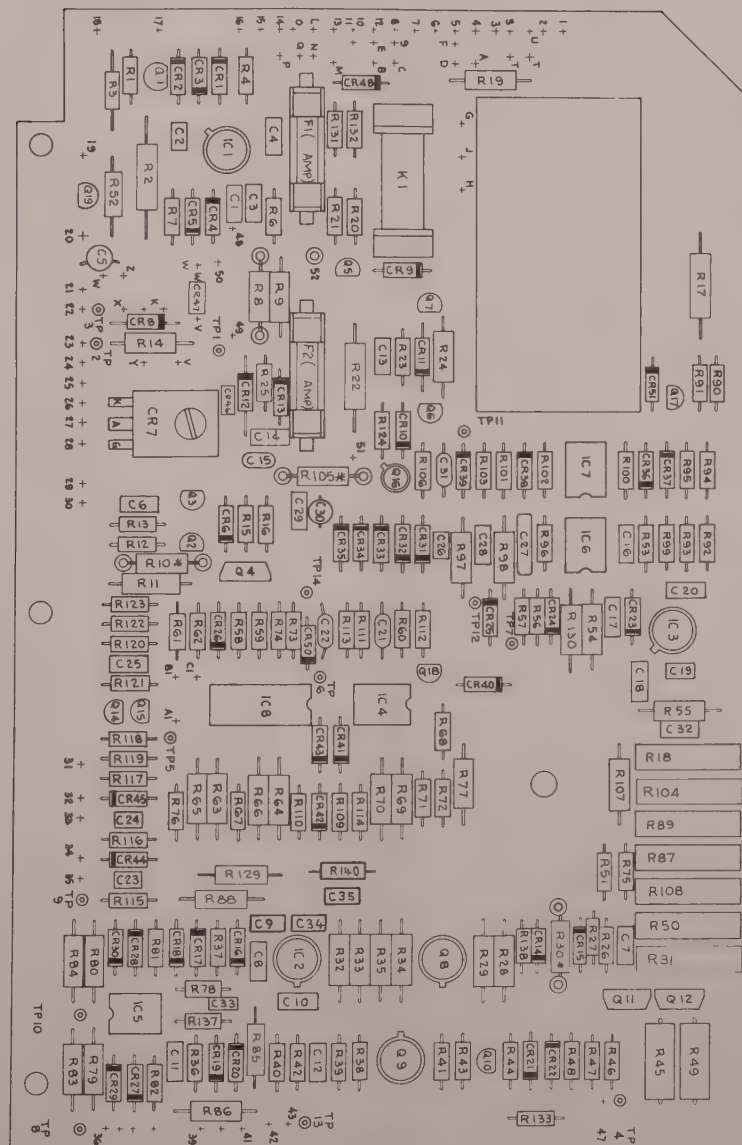
All resistor values are in ohms, 2%, 0.25W
All capacitor values are in microfarads, 10%, 200 V
All diodes are 1N 4148
All transistors are 2N4401 (nnp) or 2N4403 (pnp)

3. Symbol [A] etc., denotes junction point between multi-sheet circuits - see chart below.

Sym.	Junction points	Fig. No.
[A]	C14	9/1
	C8, R45	9/2
[B]	Q11-S, Q3-B	9/1
	C8, R45	9/2
[C]	CR35,R87,R88,CR33	9/1
	PC-29, R38	9/2



Varactor tuning and bias supply assembly A2 : Circuit diagram (Sheet 2)



Notes...

1 JUMPER PLACEMENT CHART

RF Unit type	6738A (AV)	6742A (AV)	6754A (AV)	6760A (MI)	6766A (MI)	6766A (VA)	6770A (MI)	6770A (MI)	6774A (VA)	6774A (MI)
Bias polarity	Pos.	Pos.	Pos.	Neg.	Neg.	Pos.	Neg.	Pos.	Pos.	Neg.
Transistors Q1, Q19	2N 4403	2N 4403	2N 4403	2N 4401	2N 4401	2N 4403	2N 4401	2N 4403	2N 4403	2N 4401
Jumper placement on YIG tuning and bias supply p.c. board	W-V ⁶ Y-V W-K X-Z S-T J-H D-F B-E M-L Q-O B1-C1	W-V ⁶ Y-V W-K X-Z S-T J-H D-F B-E M-L Q-O B1-C1	W-V ⁶ Y-V W-K X-Z S-T J-H D-F B-E M-L Q-O B1-C1	W-V W-X Y-K K-Z U-T J-G D-F B-E N-L P-O B1-C1	W-V W-X Y-K K-Z U-T J-G D-F B-E N-L P-O B1-C1	W-V Y-V Y-K X-Z S-T J-H D-F B-E M-L Q-O B1-A1	W-V W-X Y-K K-Z U-T J-G D-F B-E N-L Q-O B1-C1	W-V Y-V Y-K X-Z S-T J-H D-F B-E M-L Q-O B1-C1	W-V Y-V Y-K X-Z S-T J-H D-F B-E M-L Q-O B1-C1	W-V W-X Y-K K-Z U-T J-G D-F B-E N-L P-O B1-C1

2. Unless otherwise stated,

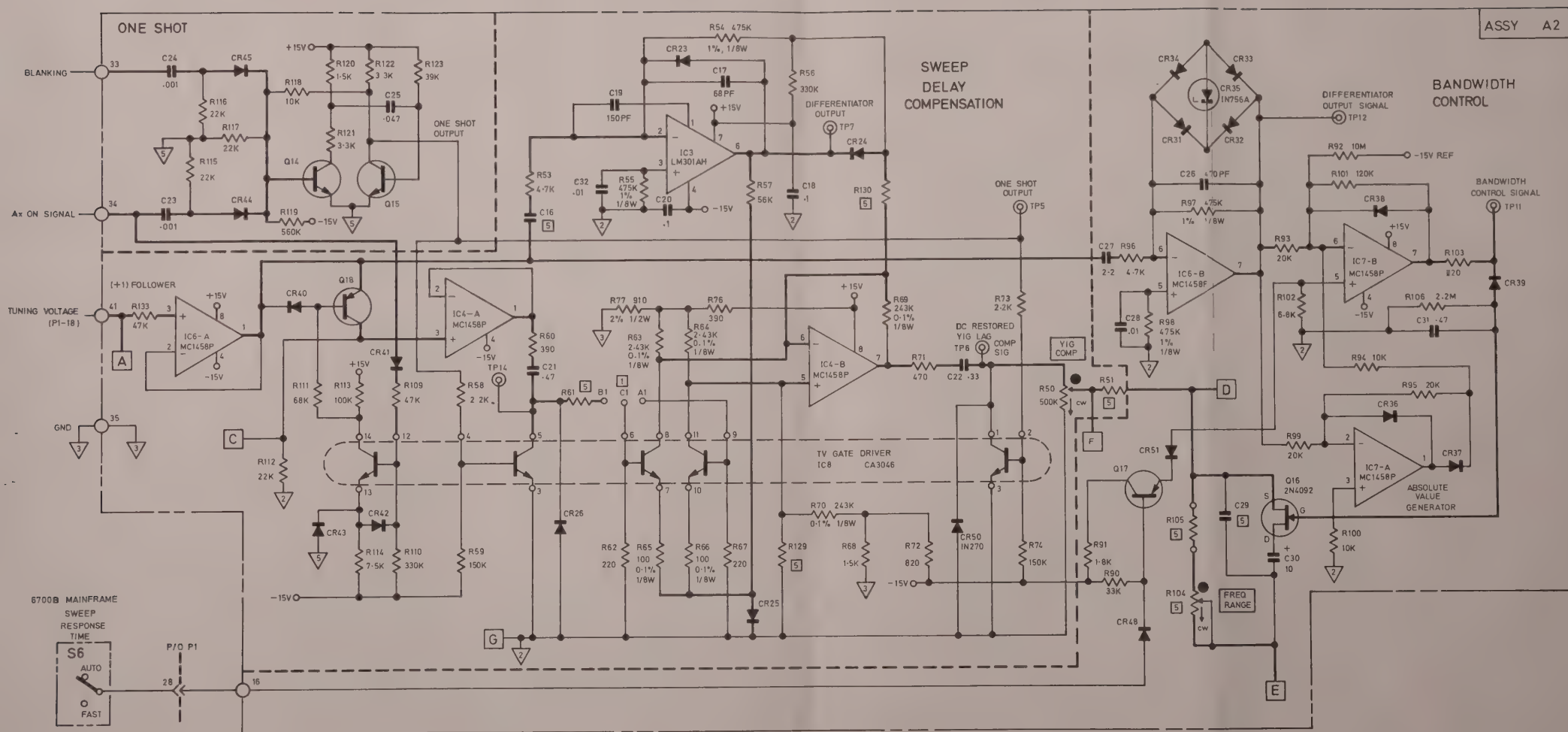
All resistors values are in ohms, 0.25 W 2%
 All transistors are 2N4401 npn or 2N4403 pnp
 All diodes are 1N4148
 All capacitors values are in microfarads, 10%, 200 V.

4. Reverse polarity for negative regulators.

5. See specific parts list for values.

6. Zener diode CR47 placed between W and V.

YIG tuning and bias supply assembly A2 : Component identification.



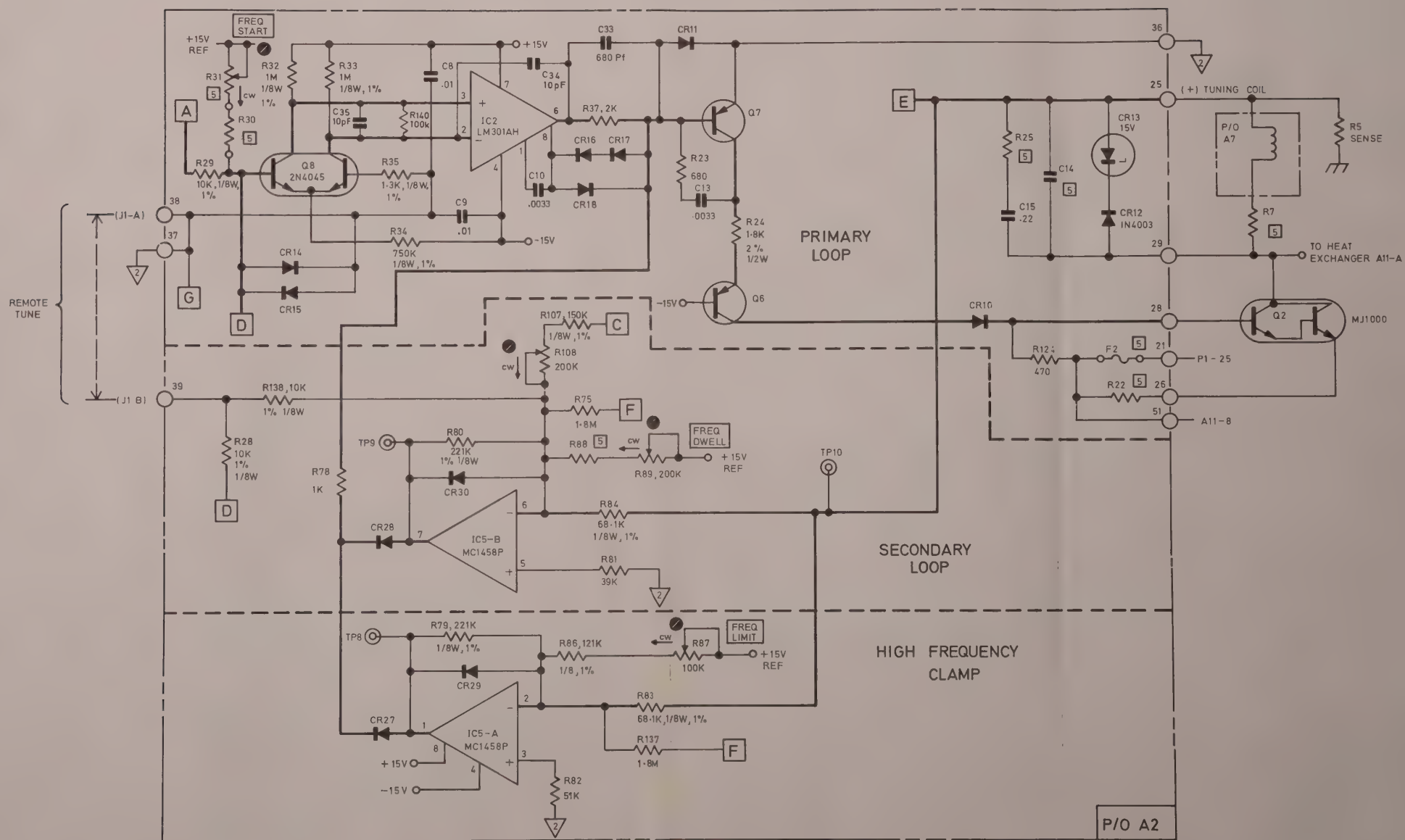


Fig. 11b

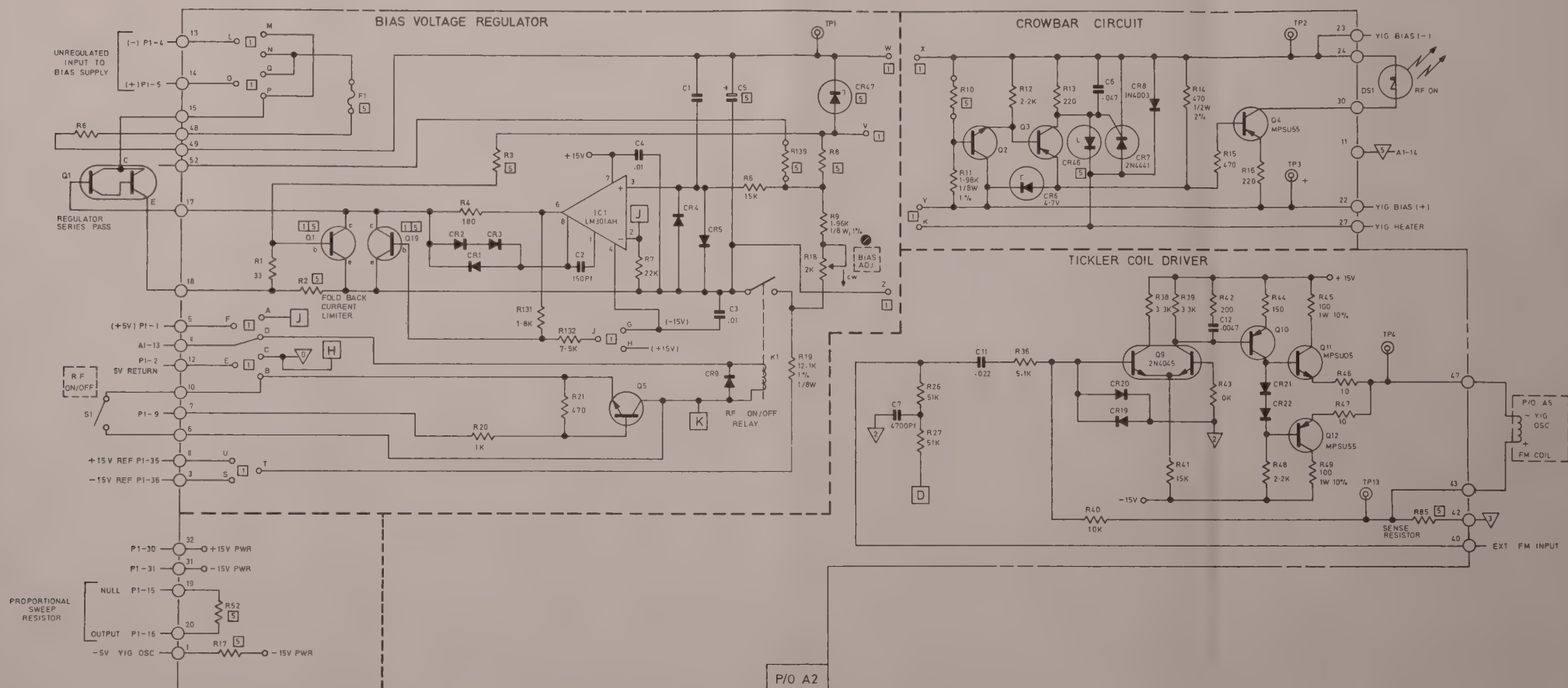
June 78

YIG tuning and bias supply assembly A2 : Circuit diagram
(Sheet 2)

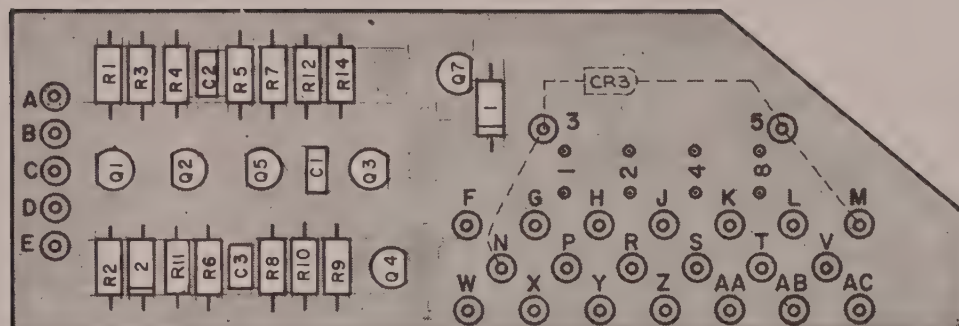
Fig. 11b
Chap. 7
Page 27

SYMBOL A DENOTES JUNCTION POINT BETWEEN MULTI-SHEET CIRCUITS. SEE CHART BELOW

SYM	JUNCTION POINTS	FIG. No.
A	R133	11a
	R29	11b
	A8 R1	Supplement 1
C	Q18-C & R112	11a
	R107	11b
D	R51, R105 & C29	11a
	Q8-B, R28	11b
E	C29, C30 & R104	11b
	R83, R84, TP10 & C14	11b
	R25 & CR13	11b
F	R75	11b
	R137	11b
	R50 & R51	11a
G	CR14, CR15, C8, C9 & R35	11b
	R50, CR50, R129, CR25 R67, R62 & CR26	11a
H		
	GND POINT "C"	11c
J	IC1-2 & R7	11c
	A8 R3	Supplement 1
K	Q5-C, CR9, K1	11c
	A8 CR1	Supplement 1



YIG tuning and bias supply assembly A2 : Circuit diagram
(Sheet 3)



SYM. DES.

1. DIODE
2. SOLDER TERM.
3. SOLDER POINT

Note :

1. Unless otherwise specified all resistors are in ohms, 0.25W, 2%. Transistors are npn 2N4401, pnp 2N4403.
2. Zener diode CR3, shown dotted, is really CR1 on main circuit (normally mounted between oscillator bias terminals), but is sometimes fitted on this assembly, A3 for convenience.

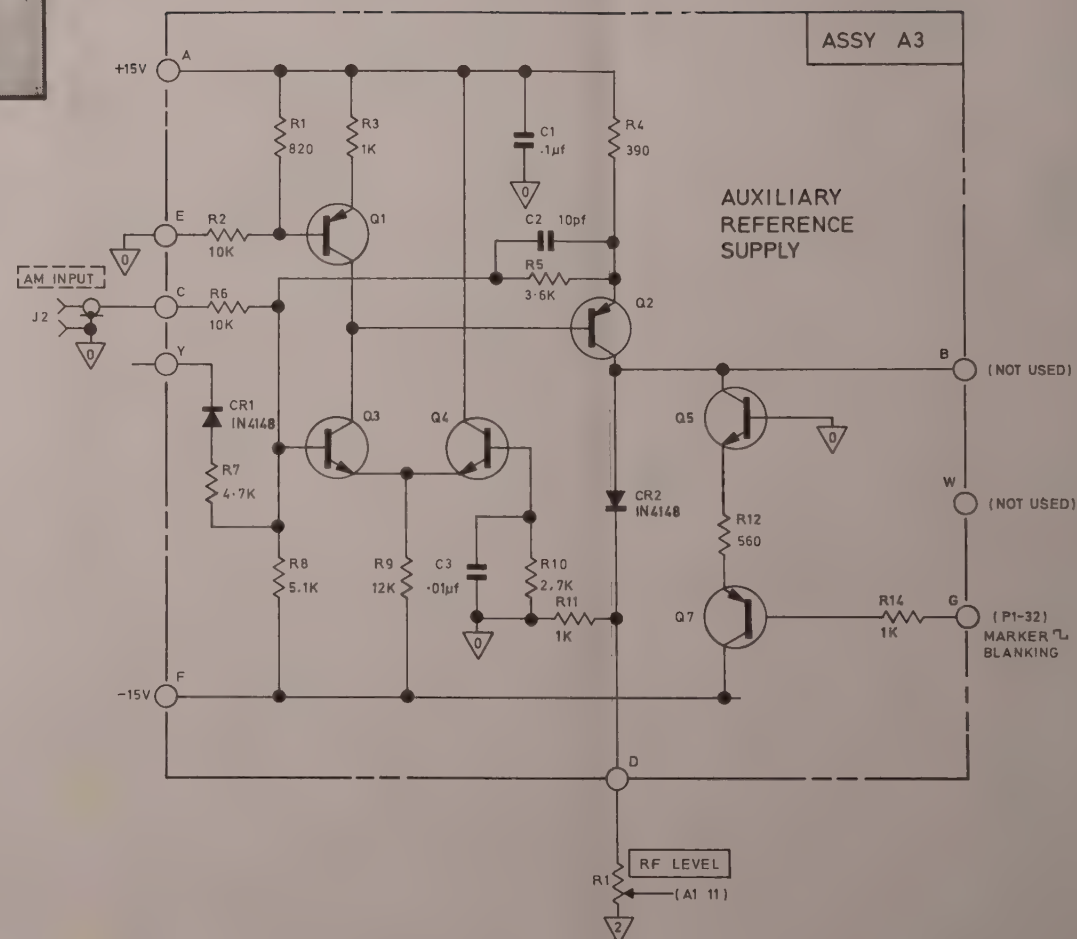


Fig. 12 Auxiliary/reference supply assembly A3 : Component identification.

Fig. 13 Auxiliary/reference supply assembly A3 : Circuit diagram.

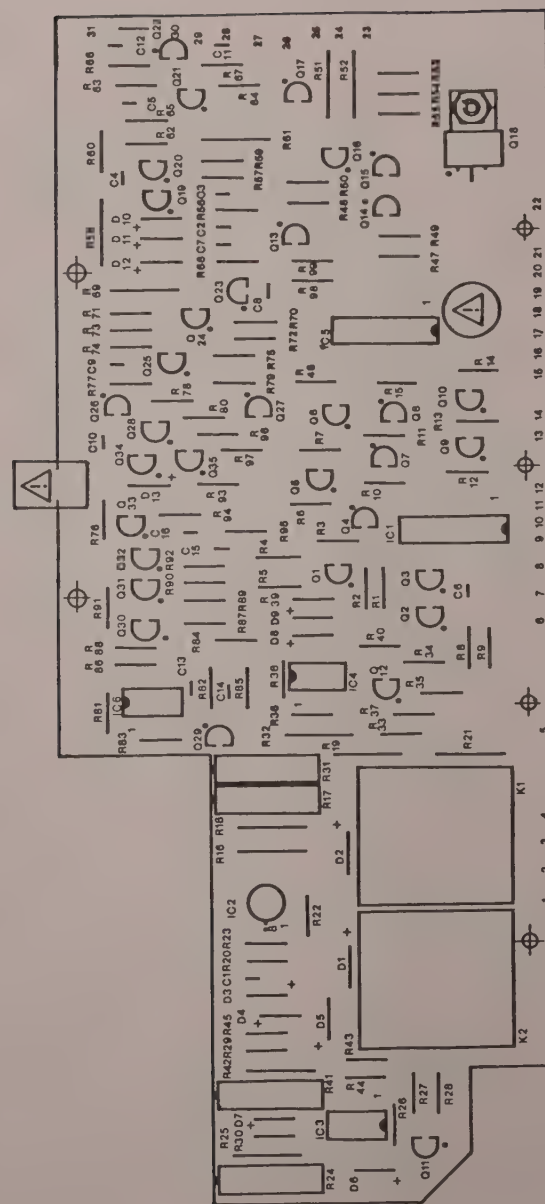


Fig. 14
Chap. 7
Page 32

Control logic assembly (type 6790A only) A5 :
Component identification.

Fig. 14
June 78

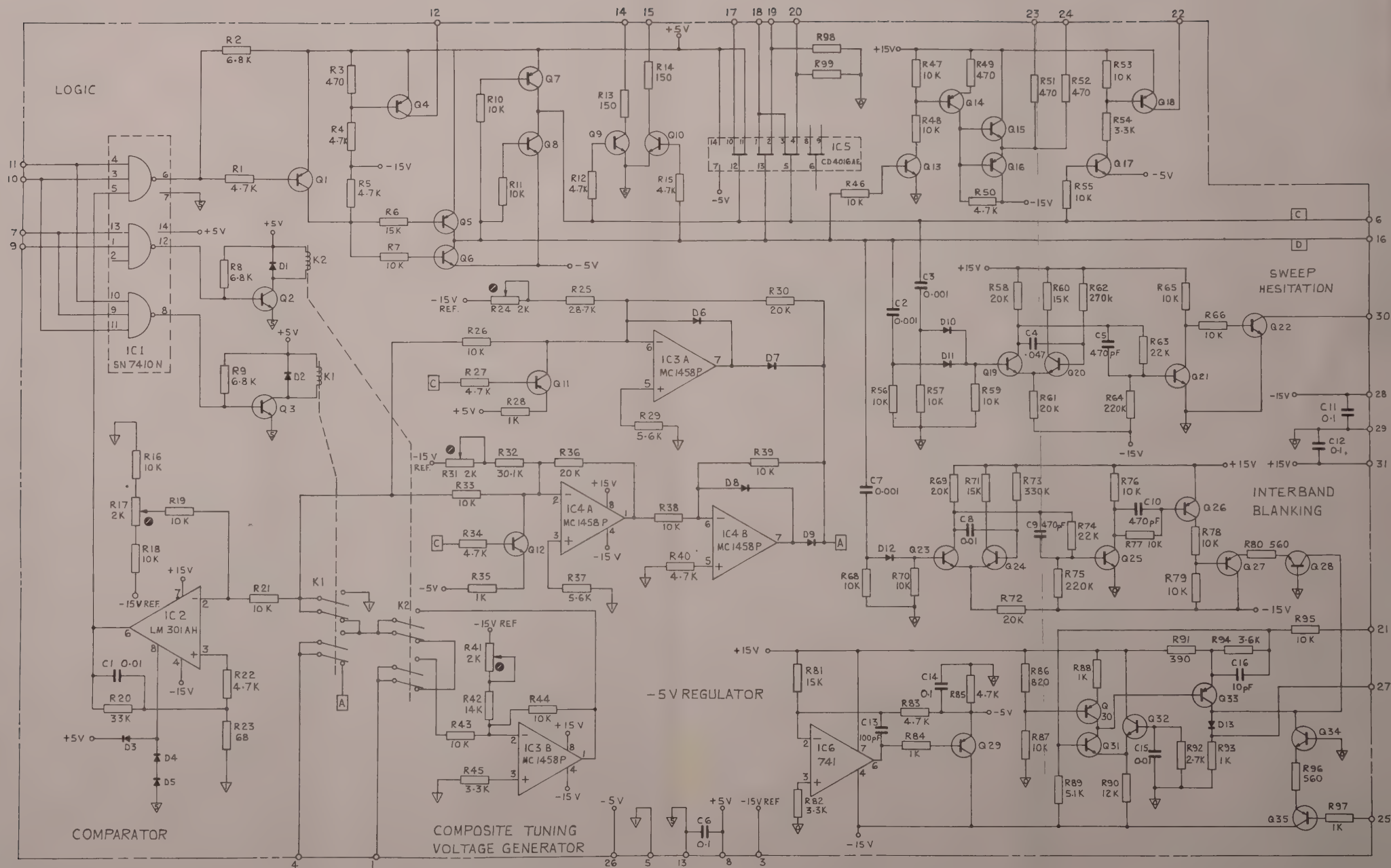


Fig. 15
June 78

Control logic assembly (type 6790A only) A5 : Circuit diagram.

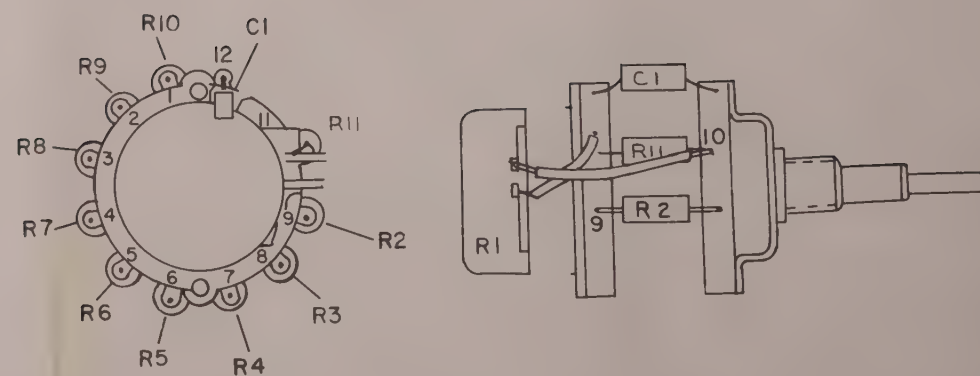
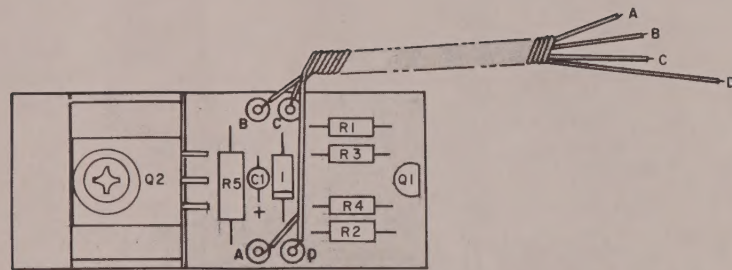


Fig. 16
Chap. 7
Page 34

Symmetrical sweep assembly A4 : Wiring diagram
and component identification.

Fig. 16
June 78

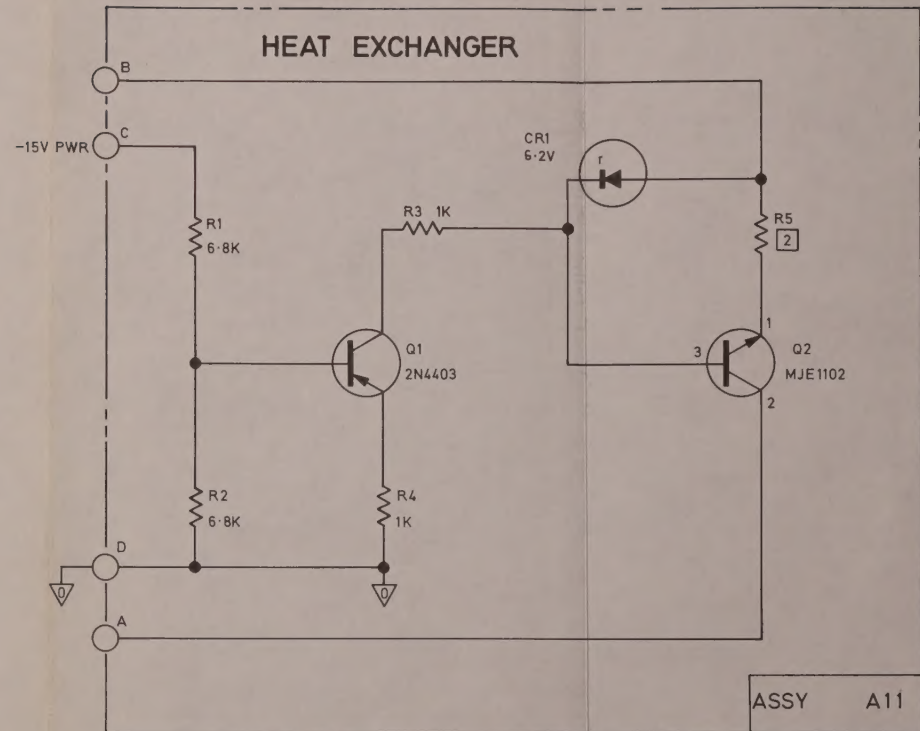


SYM: DES.

1. DIODE
 2. SOLDER TERM.

R F UNITS 6760A, 6766A, 6770A & 6774A			
COLOR	WIRE	FROM	TO
W/RED	A	PIN A	Q2 COLLECTOR
BLUE	B	PIN B	A2R22/F2
V10	C	PIN C	A3-F
BLACK	D	PIN D	R5-2

Fig. 17 Heat exchanger assembly A11 : Component identification.



NOTE

1. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE IN OHMS, 0.4W, 2%.
 2. SEE TABLE 6-17 FOR VALUE OF R5.

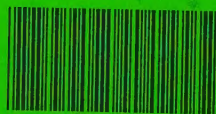
Fig. 18 Heat exchanger assembly A11 : Circuit diagram

MARCONI INSTRUMENTS LIMITED

MICROWAVE PRODUCTS DIVISION
P.O. BOX No. 10
GUNNELS WOOD ROAD
STEVENAGE, HERTS., ENGLAND
SG1 2AU

Telephone : Stevenage 2311
Telex : 82159
Telegrams : 'Sandelect' Stevenage

MP MASTER



MA23598